

## Chapter = 04

Biology 9th- Detailed Question Answers

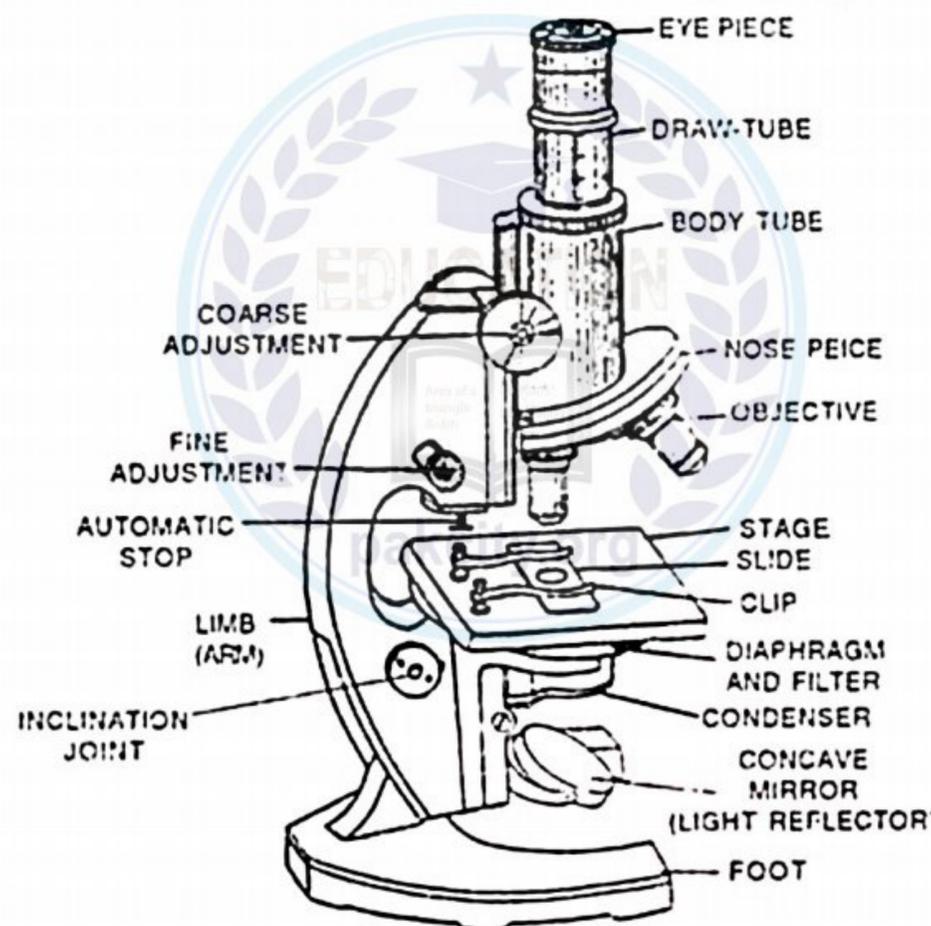
# → CELLS AND TISSUES

**Q.1: What is Cell?**

**Ans: Cell:** "All living organisms are composed of cells. It is the basic structural and functional unit of life. It is a set of organelles made up of proteins, carbohydrates, lipids and nucleic acids."

**Q.2: What is a microscope? How many parameters are important in microscopy?**

**Ans: Microscope:** Microscopes are instruments designed to produce magnified visual or photographic images of objects too small to be seen with the naked eye.



**Important Parameters in Microscopy:** There are two parameters especially important in microscopy; magnification and resolution.

- **Magnification:** The enlargement of an image is called magnification. By combining a number of lenses in the correct manner, a microscope can be produced that will yield very high magnification values.
- **Resolution:** The resolution of a microscope is defined as the smallest distance between two points on a specimen that can still be distinguished as two objects. It helps to measure clarity of object.

Both magnification and resolution are very important if we want a clear picture of something less than 0.1. For example, if a microscope has high magnification but low resolution, all we'll get is a bigger version of a blurry image.

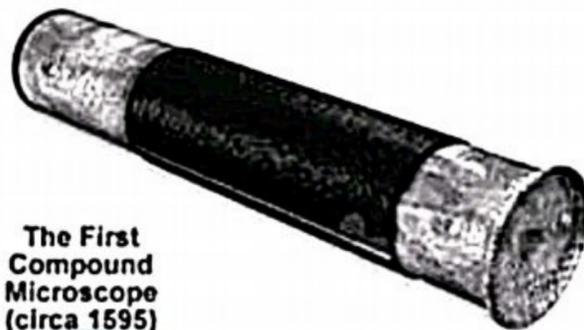
Q.3: Who invented the microscope?



Ans: Zacharias Janssen is generally believed to be the first investigator to invent the compound microscope in the 1590. It was simply a tube with lenses at each end and its magnification ranged from 3X to 9X.

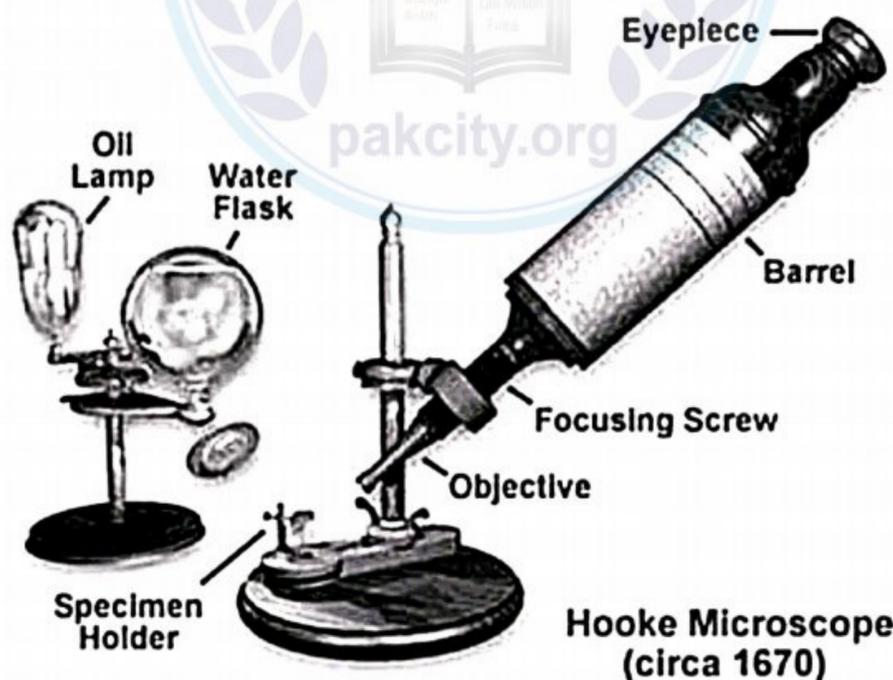


Zacharias Janssen  
(1580-1638)



The First  
Compound  
Microscope  
(circa 1595)

Robert Hooke had improved his version of the compound microscope to observe organisms.



Hooke Microscope  
(circa 1670)

Q.4: Describe the types of microscope.

Ans: Types of Microscope: There are two types of microscope are used in microscopy:

- (i) light microscope (LM)
- (ii) electron microscope (EM)

(i) **Light Microscope:** In a light microscope, visible light passes through the specimen. The magnification of a light microscope is formed by using a mixture of the powers of the eye piece and the objective lens.

(ii) **Electron Microscope:** Electron microscope differs from light microscope, that they produce an image of a specimen by using a beam of electrons rather than a beam of light. Electrons have a much shorter wavelength than visible light, and this allows electron microscopes to produce higher resolution images than standard light microscopes. Electron microscopes can be used to examine not just whole cells, but also the sub-cellular structures and compartments within them. A live cell cannot be imaged by electron microscope.



Electron microscope has a resolution as small as 0.2 nanometer (nm) and magnification upto 250,000 times.

There are two major types of electron microscopes.

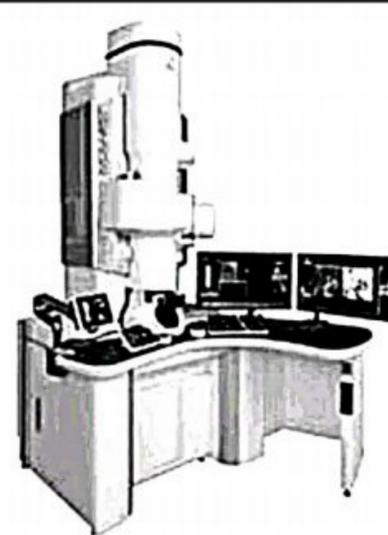
- (a) Scanning electron microscopy (SEM)
- (b) Transmission electron microscopy (TEM)

(a) **Scanning Electron Microscopy (SEM):** In scanning electron microscopy, a beam of electrons moves back and forth across the surface of a cell or tissue, creating a detailed image of the 3D surface.

(b) **Transmission Electron Microscopy (TEM):** In transmission electron microscopy, in contrast, the sample is cut into extremely thin slices before imaging, and the electron beam passes through the slice rather than skimming over its surface. TEM is often used to obtain detailed images of the internal structures of cells.



Mosquito face under electron Microscope



Electron Microscope



**Q.9: Describe the brief history of the development of cell theory.**

**Ans:** History of the Development of Cell Theory: Ancient Greeks were the first to make comprehensive attempts to organize the data of the natural world. Aristotle presented an organized observation to support the idea that all animals and plants are somehow related. Later this idea gave rise to questions like 'is there a fundamental unit of structure shared by all organisms'? But before microscope was first used in 17<sup>th</sup> century, no one knew that living organisms do share a fundamental unit i.e. cell.



Year	History
1665	Cell was first observed by <b>Robert Hooke</b> , an English scientist, discovered a honeycomb like structure in a cork slice using a primitive compound microscope. He only saw cell walls as this was dead tissue. He coined the term "cell" for these individual compartments he saw.
1670	First living cells were seen by <b>Anton van Leeuwenhoek</b> , a Dutch biologist, from pond water with a microscope.
1683	<b>Miniature animals:</b> <b>Anton van Leeuwenhoek</b> made several more discoveries on a microscopic level, eventually publishing a letter to the Royal Society in which he included detailed drawings of what he saw. Among these was the first protozoa and bacteria discovered.
1833	The center of the cell was seen by <b>Robert Brown</b> , an English botanist, discovered the nucleus in plant cells.
1839	<b>Cell theory:</b> <b>Theodor Schwann</b> , a German botanist reached the conclusion that not only plants, but animal tissue as well is composed of cells. This ended debates that plants and animals were fundamentally different in structure. He also pulled together and organized previous statement on cells into one theory, which states: 1. Cells are organisms and all organisms consist of one or more cells. 2. The cell is the basic structure unit for all organisms.
1840	<b>Albrecht von Roelliker</b> discovered that sperm and eggs are also cells.
1845	<b>Carl Heinrich Braun</b> reworked the cell theory, calling cells the basic unit of life.
1855	3rd part to the cell theory added by <b>Rudolf Virchow</b> , a German physiologist / physician / pathologist. Added that cell is not Denovo structure. This translates mean that all cells develop only from existing cells.
1862	<b>Louis Pasteur</b> was a French biologist; microbiologist and chemist provided the experimental proof of this idea.

**Q.10: How and when cell was discovered?**

Ans: Cell was first observed by **Robert Hooke**, an English scientist, discovered a honeycomb-like structure in a cork slice using a primitive compound microscope. He only saw cell walls as this was dead tissue. He found small honey comb like chambers called 'cellula' for these individual compartments he saw which were later called cell by him.

**Q.11: Who discovered the nucleus?**



Ans: In 1833, Robert Brown, an English botanist, discovered a spherical body called nucleus in the cell of orchids.

**Q.12: Who proposed the cell theory? Explain the salient features of cell theory.**

Ans: Cell Theory: One of the most important concepts in biology is that a cell is a basic structural and functional unit of living organisms. This is known as a cell theory and was proposed jointly by two scientists in 1839. A Belgian Botanist called Schleiden and the German zoologist called Schwann. In 1855 Rudolf Virchow, a German physicians proposed an important extension of cell theory-that all living cells arise from pre-existing.

The postulates of cell theory are:

- (i) All Living organisms are made of one or more cells.
- (ii) The cell is the fundamental unit of structure and function in all living organisms.
- (iii) The new cell is derived from pre-existing cells dividing into two by cell division.
- (iv) The cell contains the hereditary material which is passed from generation to generation.

**Q.13: Define Sub-cellular and Acellular Particles.**

Ans: **Sub-cellular and Acellular Particles:** According to the first principle of the cell theory all organisms are composed of one or more cells.

Viruses, prions and viroids are not composed of cells rather they are sub-cellular or Acellular particles but do not run any metabolic activity inside them. As they show some characteristics of living organisms i.e. they can increase in number and can transmit their characteristics to the next generations.

- **Sub-cellular Particles:** They are particles smaller than the living cell and are found suspended in the cytosol (of a cell) like the nucleus, Golgi complex and the mitochondria.
- **Acellular Particles:** While acellular particles/organisms are particles that do not have a cell like the viruses, viroids and prions. They are not alive/inactive outside a living environment but become active immediately they are inside a living environment (like a cell).

**Q.14: Write a few lines about a cell.**

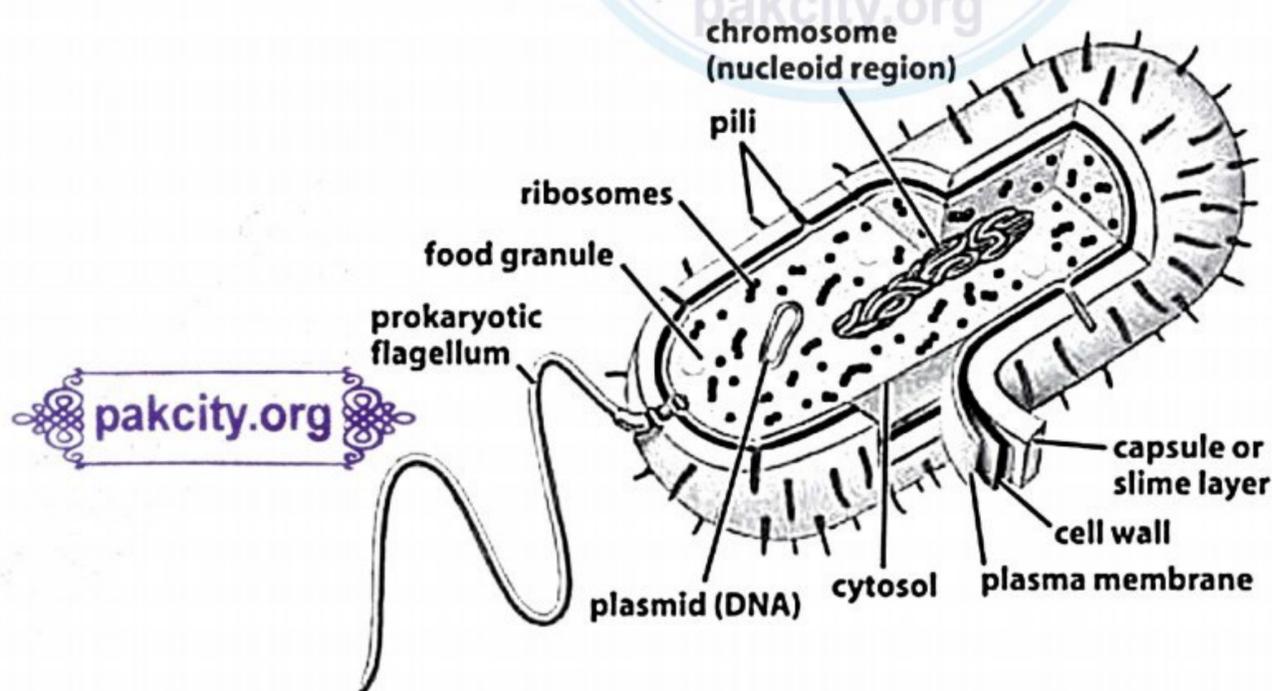
**Ans: Cell :** Cells are the basic units of organisms and all tissues and organs are composed of cells. There are different types of cells. Cells can either be prokaryotic or eukaryotic. Eukaryotic cells are eukaryotes. Plant cells are generally a cubical shape while animal cells are usually spherical. Plants cells and animal cells have evolved different organelles to perform specific functions.

The activity of an organism depends on the total activity of independent cells. Energy flow occurs in cells through the breakdown of carbohydrates by respiration. Cells contain the information necessary for the creation of new cells. This information is known as 'hereditary information' and is contained within DNA. DNA (the hereditary information of cells) is passed from 'parent' cells to 'daughter' cells during cell division.

The contents of cells from similar species are basically the same. Cells are the smallest form of life; the functional and structural units of all living things. Our body contains several billion cells, organized into over 200 major types, with hundreds of cell-specific functions. Some functions performed by cells are so vital to the existence of life that all cells perform them (e.g. cellular respiration). Others are highly specialized (e.g. Photosynthesis).

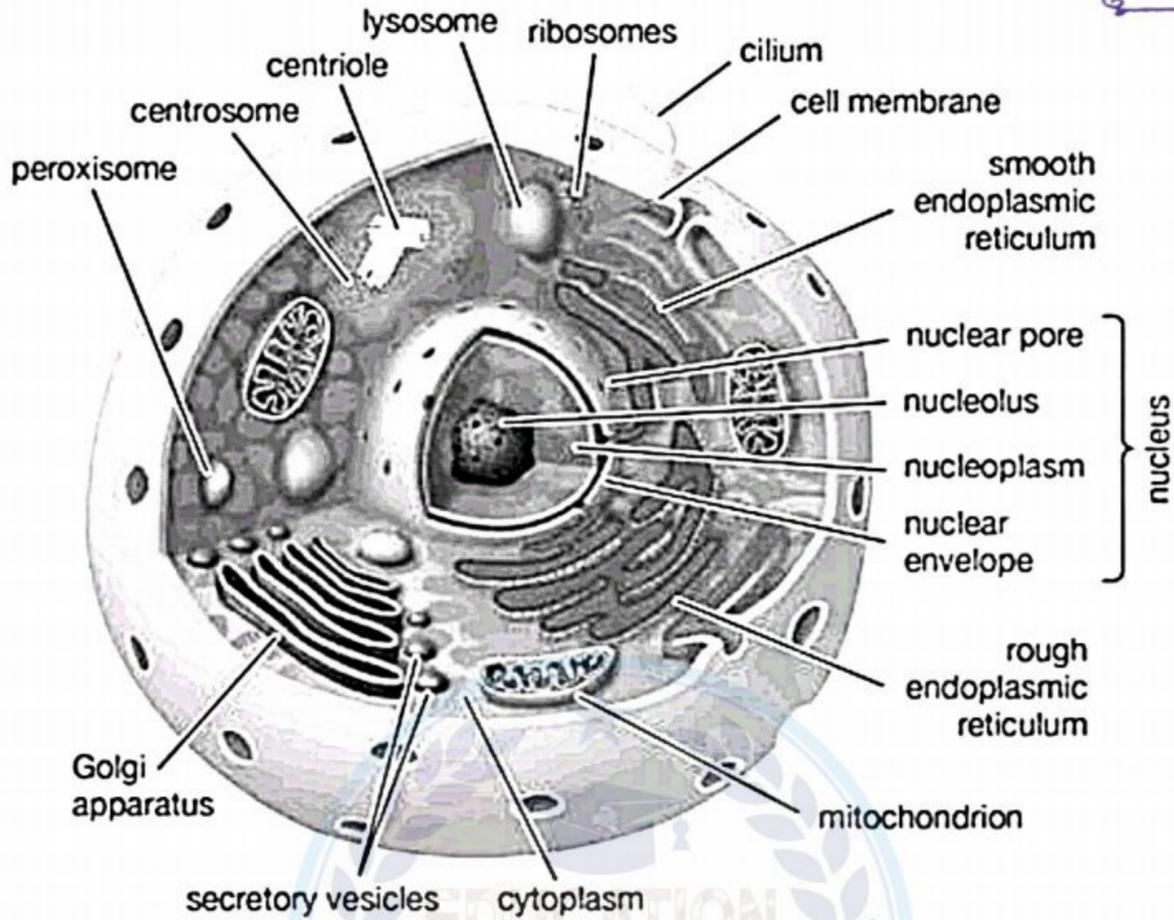
**Q.15 How many types of cells are there? Name and define them.**

**Ans: Prokaryotes:** Prokaryotes are organisms without a cell nucleus, or any other membrane bound organelles. Most are unicellular, but some prokaryotes are multicellular.



*The structure of bacterial (prokaryotes) cell*

**Eukaryotes:** Eukaryotes are organisms whose cells are organized into complex structures by internal membranes and a cytoskeleton; The most characteristic membrane bound structure is the nucleus. Animals, plants, fungi, and protists are eukaryotes.



*The structure of an animal (eukaryotic) cell*

**Q.16: Compare prokaryotes and eukaryotes in tabulated form.**

**Ans: Comparison between Prokaryotes and Eukaryotes:**

Cellular Structures	Prokaryotic cell	Eukaryotic cell
<b>Nucleus</b>	Absent	Present
<b>True Membrane Bound Nucleus</b>	Absent	Present
<b>Number of chromosomes</b>	One but not true chromosome Plasmids	More than one
<b>Number of cells</b>	Usually unicellular (some cyanobacteria may be multicellular)	Usually multicellular but few are unicellular
<b>Genetic Recombination</b>	Partial, unidirectional transfers DNA	Meiosis and fusion of gametes
<b>Lysosomes and Peroxisome</b>	Absent	Present

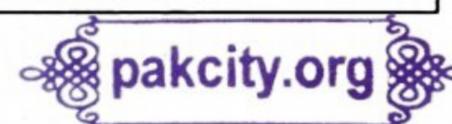
Microtubules	Absent or rare	Present
Endoplasmic reticulum	Absent	Present
Mitochondria	Absent	Present
Cytoskeleton	May be absent	Present
Ribosomes	Smaller 70S	Larger 80S
Vesicles	Present	Present
Golgi Apparatus	Absent	Present
Chloroplasts	Absent (chlorophyll scattered in the cytoplasm)	Present in plants
Plasma membrane with steroid	Usually no	Yes 
Permeability of nuclear membrane	Not present	Selective
Vacuoles	Absent	Present
Cell Size	1-10 $\mu\text{m}$	1-100 $\mu\text{m}$
Cell Wall	Usually chemically complex	Only in plant cells and fungi (chemically simpler)
Flagella	Submicroscopic in size, composed of only one fiber	Microscopic in size; membrane bound
Example:	Bacteria and Cyanobacteria	Animals and plants

**Q.17: Differentiate between prokaryotic and eukaryotic cell.**

Ans:

	Prokaryotic Cell	Eukaryotic Cell
1.	Nuclear membrane is absent therefore prokaryotic cells do not possess distinct nucleus.	A double nuclear membrane is present. They have well defined nucleus.
2.	They do not have many membrane bound structures e.g. Mitochondria, endoplasmic Reticulum, Golgi apparatus etc.	They have membrane bounded structures (organelles).
3.	Ribosomes are of small size and freely scattered in cytoplasm.	Ribosomes are of large size and present either on endoplasmic reticulum or free in cytoplasm.

4.	Nucleoplasm is absent.	Nucleoplasm is present.
5.	Single chromosome is found.	Proper chromosomes in diploid numbers are present.
6.	Respiratory enzymes are located on the inner surface of the cell membrane.	Respiratory enzymes are present in mitochondria.
7.	These cells are simple and comparatively smaller in size i.e. average 0.5-10nm in diameter.	These cells are complex comparatively large in size i.e. 10-100nm in diameter average.
8.	Bacteria and cyanobacteria are examples of Prokaryotes.	Fungi, algae, animal and plants are examples of eukaryotes.



**Q.18: Describe the cell as a structural and functional unit of life.**

Ans: **Cell as a Structural Unit:**

- (i) All living organisms are composed of cells.
- (ii) Cells are the unit of structure of living organisms or the building block of which living things are made.
- (iii) Cells are of many different shape and sizes.

**Cells as a Functional Unit:**

- (i) Cells have to perform different functions.
- (ii) All basic functional activities, characteristics of living things occur in the cell.
- (iii) Therefore, cell is a unit of function of all living organisms.

**Q.19: Write the differences between plant cell and animal cell.**

Ans: **Difference Between Animal Cell and Plant Cell:**

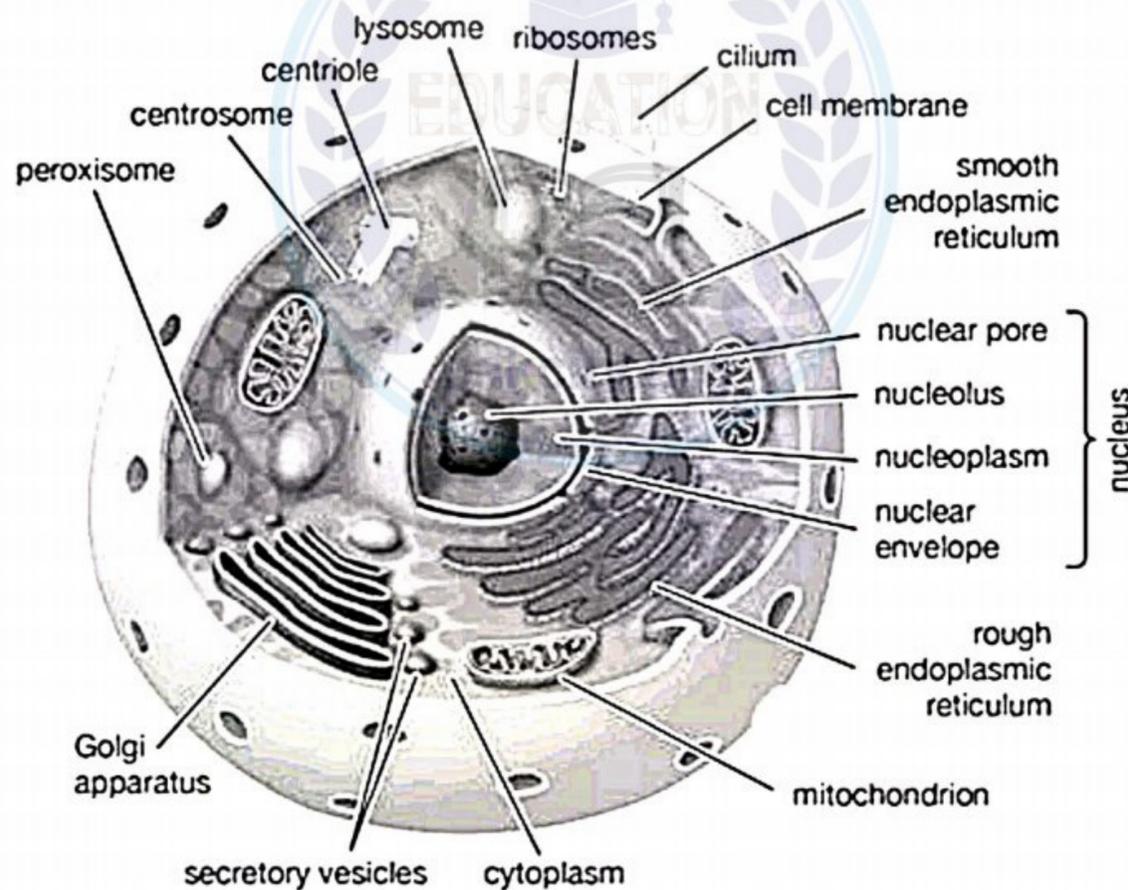
	Animal Cell	Plant Cell
1.	A cell wall is absent in animal cell but they have cell membrane which is made up of protein and lipid.	Plant cells have rigid cellulose cell wall in addition to the cell membrane.
2.	Plastids are absent in animal cells.	Almost all plants cells contain plastids such as chloroplasts, chromoplasts and leucoplasts.
3.	Animal cells usually have small vacuoles (if any).	Plant cells have a large central vacuole filled with cell sap in mature cells.
4.	Centrosomes are present in animal cell which help in cell division.	Centrosomes are absent in plant cell.

5.	The cytoplasm fills the cell.	Its cytoplasm is reduced to a thin lining.
6.	Animals do not have plasmodesmata or pits.	Plant cells contain plasmodesmata or pits Nucleus if found near the edge or periphery of the mature cell.
7.	Nucleus is generally found at the centre of the cytoplasm.	Plant cells rarely contain Lysosomes as the plant vacuole handles molecule degradation.
8.	Animal cells possess Lysosomes which contain enzymes that digest cellular macromolecules.	Plant cells do not typically contain Centrioles.
9.	Animal cells contain these cylindrical structures that organize the assembly of microtubules during cell division.	Plant cells have rigid cellulose cell wall in addition to the cell membrane.

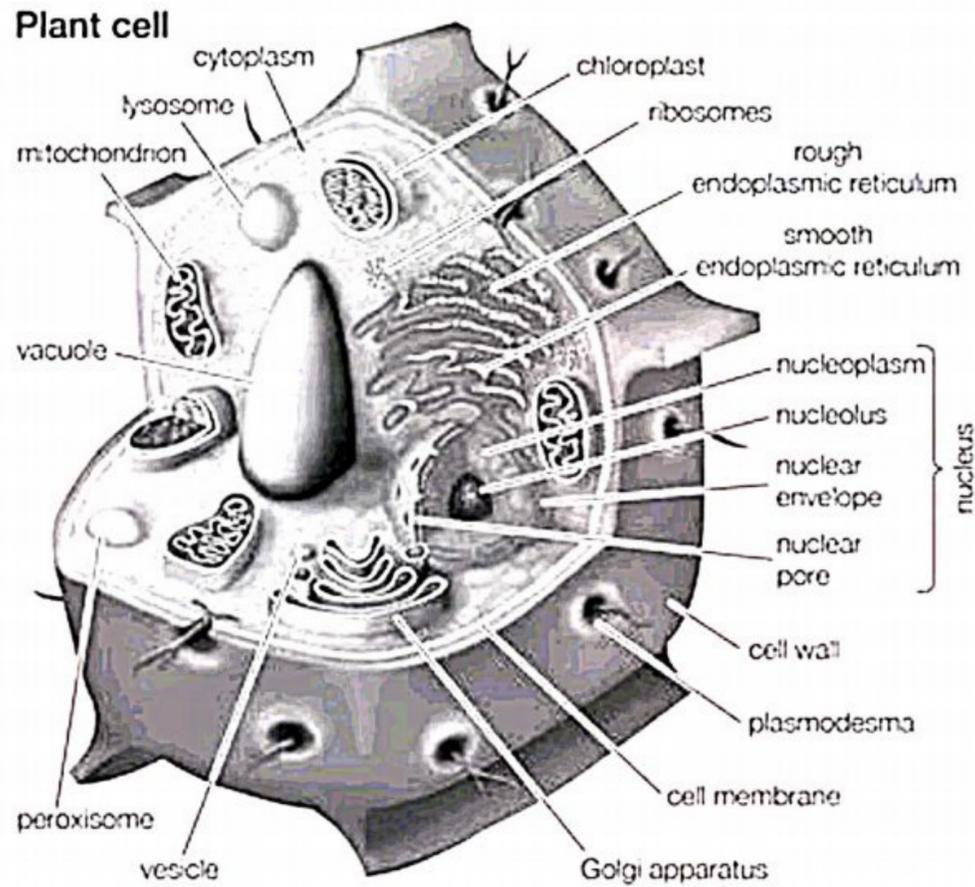


**Q.20: Draw and label plant cell and animal cell.**

Ans:



**Animal Cell**



**Plant Cell**

**Q.21: Name the organelles which are present in a typical cell.**

**Ans:** The organelles of a typical cell are:

1. Cell wall (only in plant cell)
2. Cell Membrane
3. Nucleus
4. Cytoplasm: It Contains
 

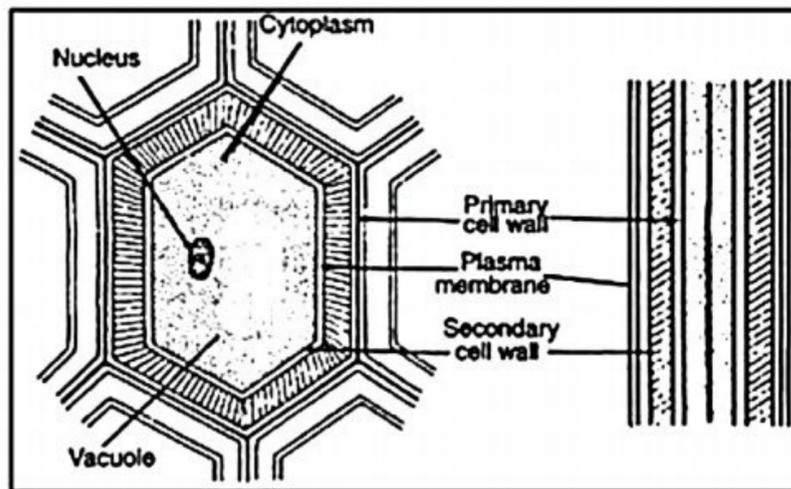
(i) Mitochondria	(ii) Endoplasmic Reticulum
(iii) Golgi bodies	(iv) Ribosomes
(v) Centrioles (only in animal cell)	(vi) Plastids (only in plant cell)
(vii) Vacuoles	

**Q.22: Explain the structure and function of cell wall.**

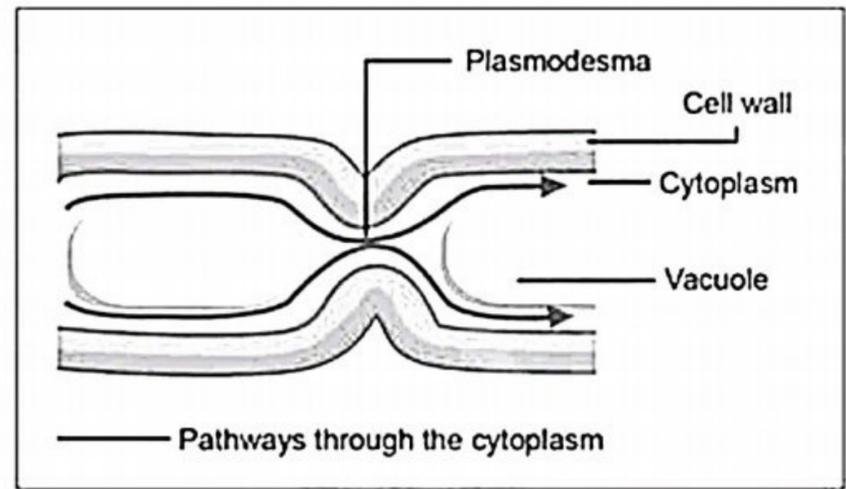


**Ans:** A cell wall is a tough, rigid non-living and permeable protective layer in some cell types. This outer covering is positioned next to the cell membrane (plasma membrane) in plant cells, fungi, algae and bacteria. The cell wall has many important functions in a cell including protection, structure and support.

**Composition of Cell Wall:** Cell wall composition varies depending on the organism. In plants, the cell wall is composed mainly of strong fibers of cellulose. Bacterial cell walls are composed of a -sugar and amino acid called Peptidoglycan. The main components of fungal cell walls are chitin, glucans and proteins. In plants, the wall is composed of o



*structure of the cell wall*



*cell wall showing plasmodesma*

**Structure of Cell Wall:** It may consist up to three layers that help to support the plant. These layers include the middle lamella, the primary cell wall and the secondary cell wall.

**Middle lamella:** It separates one cell from another. It is a thin membranous layer on the outer side of the cell and is made of a sticky substance called pectin and cellulose.

**Primary Cell Wall:** It lies on the inside of the middle lamella and is mainly composed of cellulose.



**Secondary Cell Wall:** It lies alongside the cell membrane. It is made up of a thick and tough material of cellulose which is held together by a hard, water proof substance called lignin. It is only found in cells which provide mechanical support in plants, i.e. some cells of xylem like tracheid and vessel.

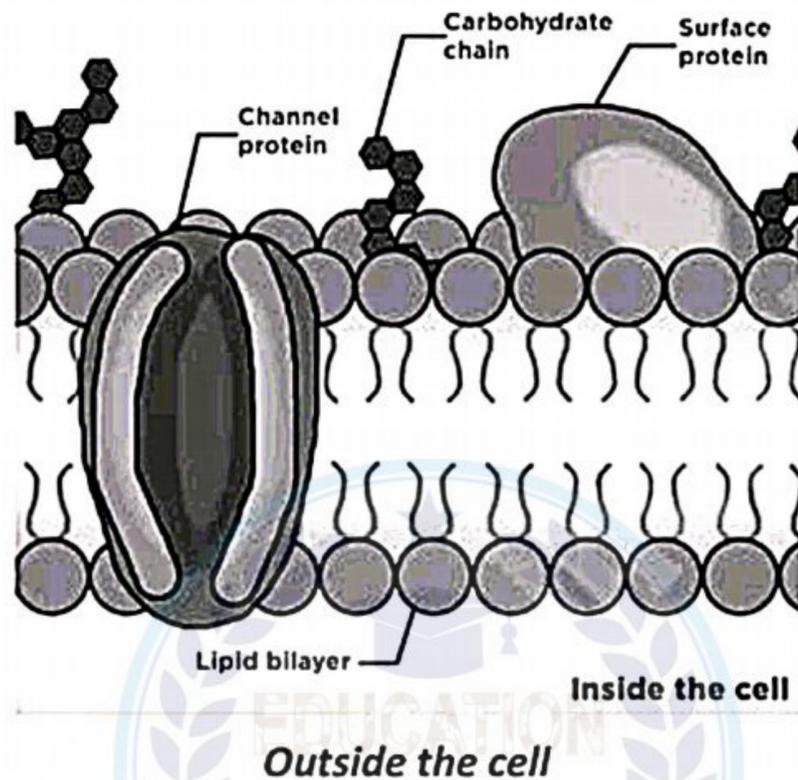
The opening in the cell wall is called plasmodesmata which contain strands of cytoplasm that connect adjacent cells. This allows cells to interact with one another, allowing molecules to travel between plant cells.

**Functions of Cell Wall:** The main function of the wall is to protect the inner part of the plant cell, it gives plant cells a more uniform and regular shape and provides support for the plant body. The cell wall is completely permeable to water and mineral salts which allows distribution of nutrients throughout the plant.

**Q.23: Explain the structure and function of cell membrane.**

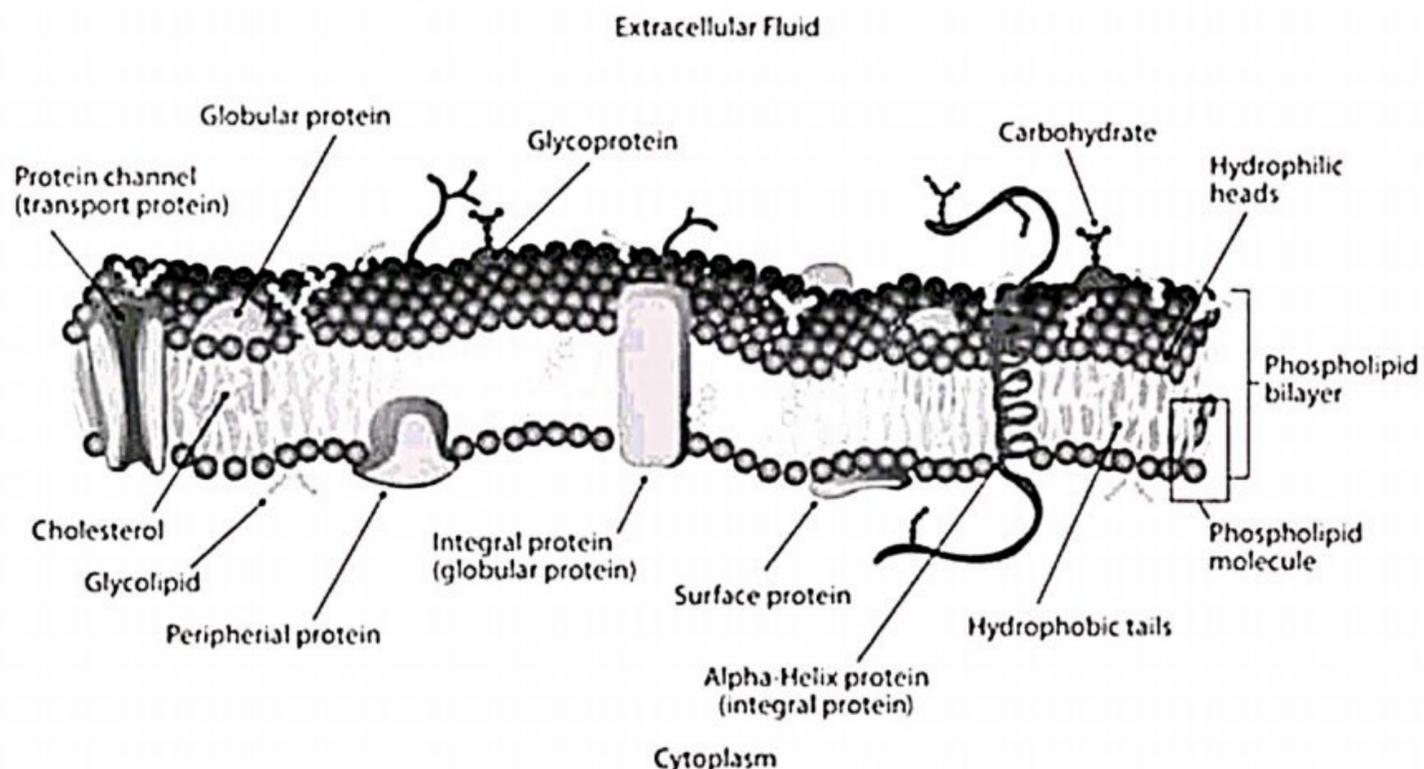
Ans: The cell membrane is the outer most living boundary of all cells. The cell membrane, also called the plasma membrane, physically separates the intracellular space (inside the cell) from the extracellular environment (outside the cell). The cell membrane surrounds and protects the cytoplasm.

The cell membrane is composed of a double layer (bilayer) of special lipids called phospholipids.



**Q.24: Describe the fluid mosaic model.**

Ans: S. J. Singer and G. L. Nicolson proposed the Fluid Mosaic Model of the cell membrane in 1972. This model describes that phospholipids acting like matrix and conjugated glycolproteins (glucose and protein together) may float freely in this matrix.



This model describes the structure of the cell membrane as a fluid structure with various protein and carbohydrate components floating freely in the membrane. All the exchange between the cell and its environment have to pass through the cell membrane. The cell membrane is selectively permeable to ions (e.g. hydrogen, sodium), small molecules (oxygen, carbon dioxide) and larger molecules (glucose and amino acids) and controls the movement of substances in and out of the cells. It performs many important functions within the cell such as osmosis, diffusion, transport of nutrients into the cell, processes of ingestion and secretion.



**Q.25: How does movement across the cell membrane occur?**

**Ans: Movement Across the Membrane:** Movement of substances across cell membranes is necessary as it allows cells to acquire oxygen and nutrients, excrete waste products and control the concentration of required substances in the cell (e.g. oxygen, water, hormones, ions, etc). This movement occurs by diffusion, osmosis, facilitated diffusion and active transport.

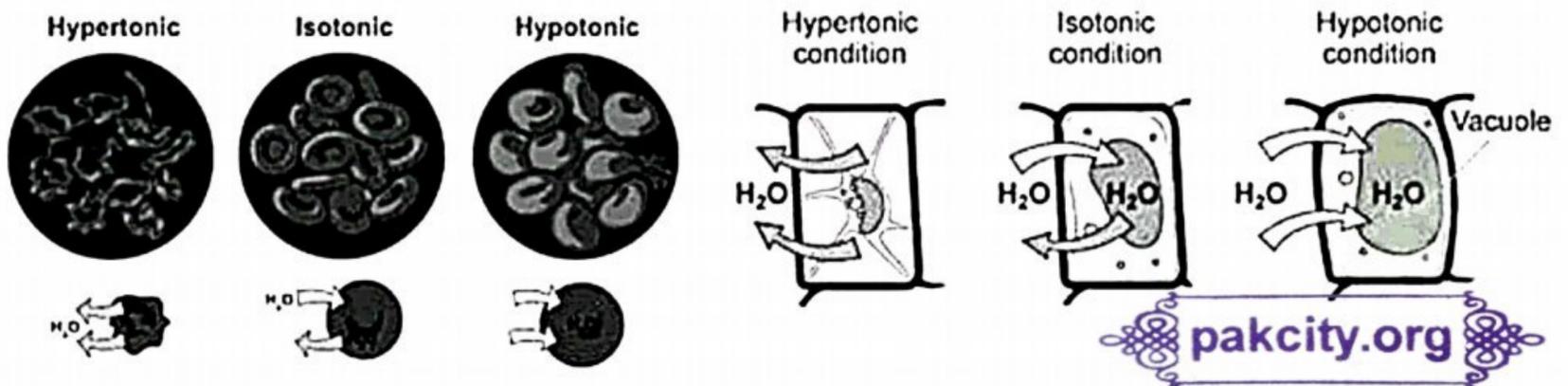
**Diffusion:** Diffusion is the movement of substance from a region of high concentration to low concentration. It is therefore said to occur down a concentration gradient. Diffusion is a passive process which means it does not require any energy input. It can occur across a living or non-living membrane and can occur in a liquid or gas medium.

**Examples:** Diffusion of carbon dioxide, oxygen, water and other small molecules those are able to dissolve within the lipid bilayer.



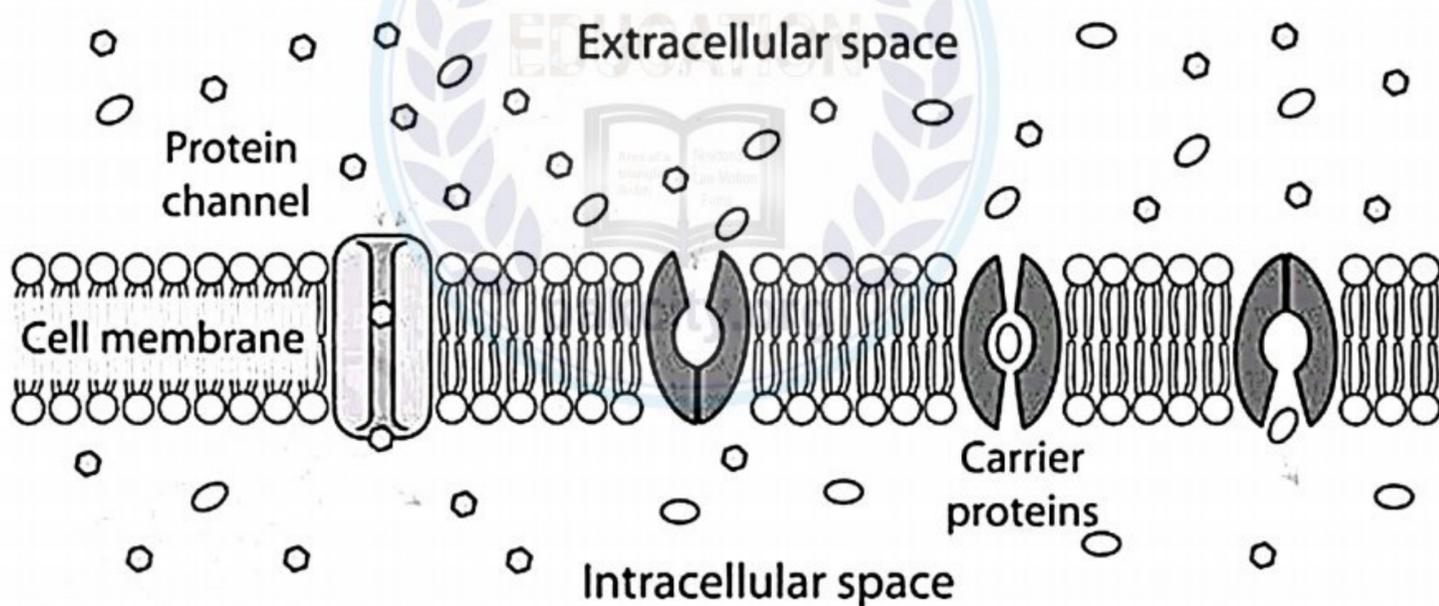
**Osmosis:** Movement of water always occurs down a concentration gradient, i.e., from dilute solution of concentrated solution. Osmosis is also passive process and does not require any input of energy. Cell membranes allow molecules of water to pass through, but they do not allow molecules of most dissolved substance, e.g. salt and sugar, to pass through it.

In biological systems, osmosis is vital to plant and animal cell survival. Following figure demonstrates how osmosis affects red blood cells and plant cell, when they are placed in three different solutions with different concentrations.

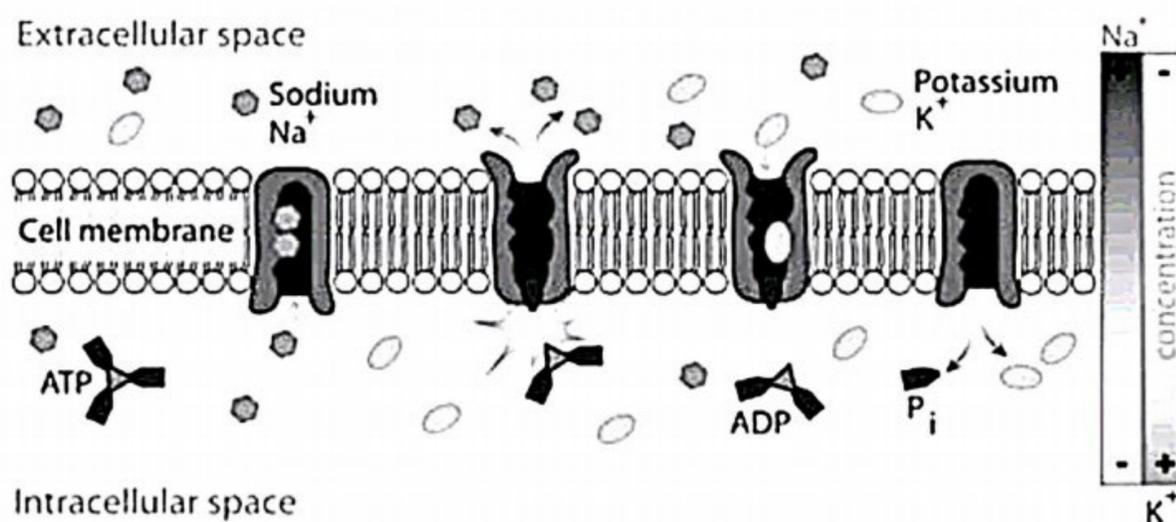


Plant cells use osmosis to absorb water from the soil and transport it to the leaves. In hypertonic conditions a plant cell loses water and cytoplasm shrinks and shrinkage of cytoplasm called plasmolysis. Osmosis in the kidneys keeps the water and salt level in the body and blood at the correct levels.

**Facilitated Diffusion:** Facilitated diffusion is a special form of diffusion which allows rapid exchange of specific substance. Particles are taken up by carrier proteins which change their shape as a result. The change in shape causes the particles to be released on the other side of the membrane.



**Active Transport:** Active transport is the movement of substance against a concentration gradient, from a region of low concentration to high concentration using an input of energy. In biological systems, the form in which this energy occurs in adenosine triphosphate (ATP). Examples of substance moved include sodium and potassium ions as shown in the figure.



ATP and ADP are molecules involved with moving energy within cells.

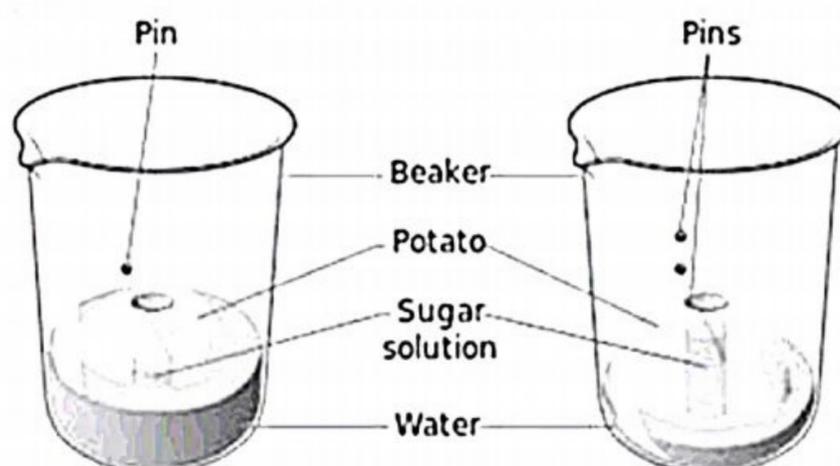
**Activity: Predicting the direction of osmosis apparatus:** [pakcity.org](http://www.pakcity.org)

\* Beaker \* Large potato \* Potato peeler/scalpel \* Pins

\* Concentrated sucrose/sugar solution. To obtain this, add 100g of sugar to 200ml of water

**Procedure:**

1. Peel off the skin of a large sized potato with a scalpel/potato peeler.
2. Cut is one end to make the base flat.
3. Make a hollow cavity in the potato almost to the bottom of the potato.
4. Add the concentrated sugar solution into the cavity of the potato, filling it about half way. Mark the level by inserting a pin at the level of the sugar solution (insert the pin at an angle into the cavity at the level)(A).
5. Carefully place the potato in the beaker containing water.
6. Observe what happens to the level of the sugar solution in the potato.
7. After 15 to 20 minutes, mark the level by inserting the second pin at the level of the sugar solution (insert as the first pin)(B).



(A) Before Osmosis

(B) After Osmosis

**Q.26: Describe the composition and function of cytoplasm.**

Ans: **Cytoplasm:** The cytoplasm is the jelly-like substance that fills the cell. It consists of up to 90% water. It also contains dissolved nutrients and waste products.

**Functions:** Its main function is to hold together the organelles which make up the cytoplasm. It also nourishes the cell by supplying it with salts and sugars and provides a medium for metabolic reactions to occur.



**Q.27: What is the composition and function of cytoskeleton?**

Ans: **Cytoskeleton:** A microscopic network of protein consists of microtubules and various filaments that spread out through the cytoplasm. Microtubules are made of tubulin while filaments are made up of actin protein.

**Function:** It provides both structural support and means of transport within the cell.

**Q.28: Write a note on nucleus.**

Ans: **Nucleus or Karyon:** It is the most important, the largest and visible organelle of a cell. It is present in the centre of the animal cell. It contains the entire cell's genetic information in the form of DNA. The presence of a nucleus is the primary factor that distinguishes eukaryotes from prokaryotes. It consists of the following four parts:

- |                      |                  |
|----------------------|------------------|
| (i) Nuclear Membrane | (ii) Nucleoplasm |
| (iii) Nucleolus      | (iv) Chromosome  |

(i) **Nuclear Membrane:** Nucleus is covered by two phospholipid membranes known as nuclear envelope that separates the nucleus and its contents from the cytoplasm. Nuclear pores are found in the nuclear envelope and help to regulate the exchange of materials (such as RNA and proteins) between the nucleus and the cytoplasm.

**Function:** Various materials diffuse in and out of the nucleus through this membrane.

(ii) **Nucleoplasm:** Inside nuclear envelope, granular fluid is present called nucleoplasm. It contains nucleoli and a network of thread-like structures called chromatin network. The genetic material is found in chromatin network.

**Function:** It has few complex and important materials which help in the synthesis of DNA and RNA.

(iii) **Nucleolus:** In nucleus an aggregation of RNA is also present called nucleolus. It is a small rounded body. It has no membrane.



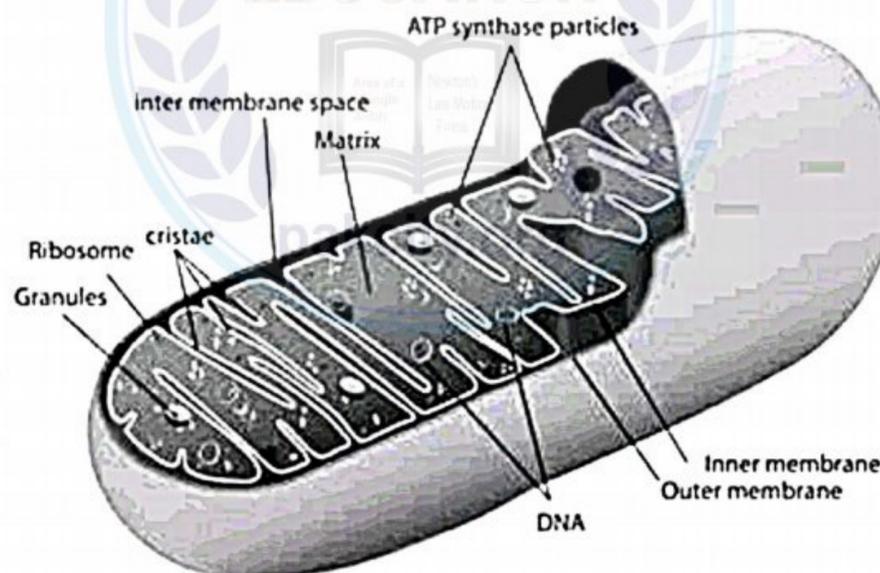
(iv) **Chromosomes:** They are large, elongated and thread like structures. They are composed of Deoxyribonucleic Acid (DNA) and protein. The number of chromosomes in the cells of all individuals of the same species always remains the same.

**Function:** They play significant role in the inheritance of characters as well as in controlling or regulating the cell activities.

**Q.29: Explain the structure and function of mitochondria.**

**Ans: Mitochondria:** A mitochondrion is a membrane bound organelle found in eukaryotic cells. Mitochondria contain two phospholipid bilayers: there is an outer membrane, and an inner membrane. The inner membrane contains many folds called cristae which contain specialized membrane proteins that enable the mitochondria to synthesize ATP. Inside the inner membrane is a jelly-like fluid called matrix.

**Function:** Mitochondria play an important role in respiration. They contain enzymes which break the food for the production of energy.



**Q.30: Why mitochondria is also called power house of cell?**

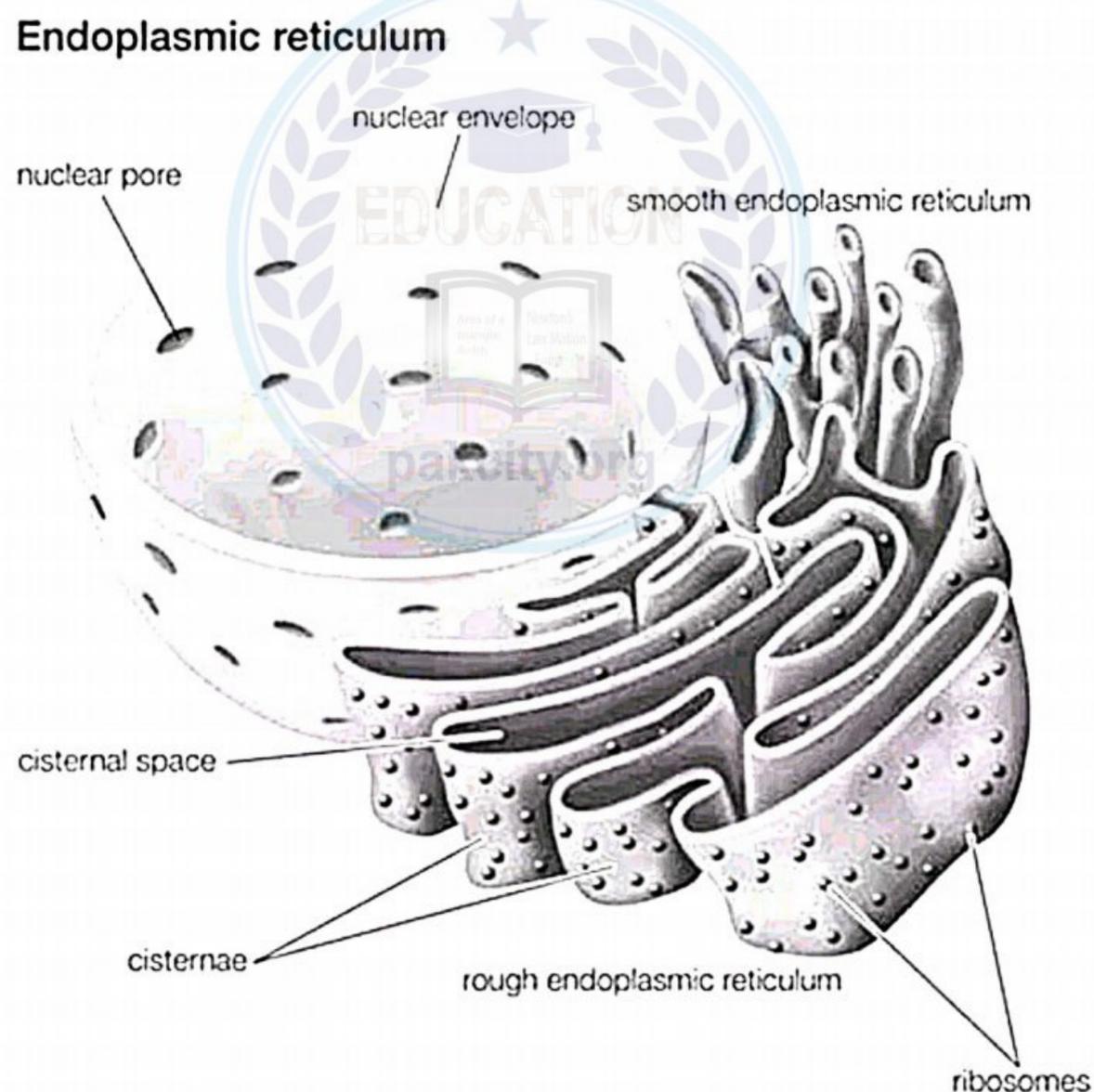
**Ans:** Mitochondria is the site of aerobic respiration. During aerobic respiration energy is produced in the form of ATP. Therefore the mitochondria is also called "Power House" of cell.

**Q.31: Write a note on Endoplasmic Reticulum.**

**Ans: Endoplasmic Reticulum:** The endoplasmic reticulum (ER) is an organelle found in eukaryotic cells only. The ER has a double membrane consisting of a network of hollow tubes, flattened sheets and round sacs. These flattened, hollow folds and sacs are called cisternae. The ER is located in the cytoplasm and is connected to the nuclear envelope. There are two types of endoplasmic reticulum: smooth and rough ER. 

**Smooth Endoplasmic Reticulum:** It does not have any Ribosomes attached. It is involved in the synthesis of lipids, including oils, phospholipids and steroids. It is also responsible for metabolism of carbohydrates, regulation of calcium concentration and detoxification.

**Rough Endoplasmic Reticulum:** It is covered with Ribosomes giving the endoplasmic reticulum its rough appearance. It is responsible for protein synthesis and plays a role in membrane production. The folds present in the membrane increase the surface area allowing more Ribosomes to be present on the ER, thereby allowing greater protein production.



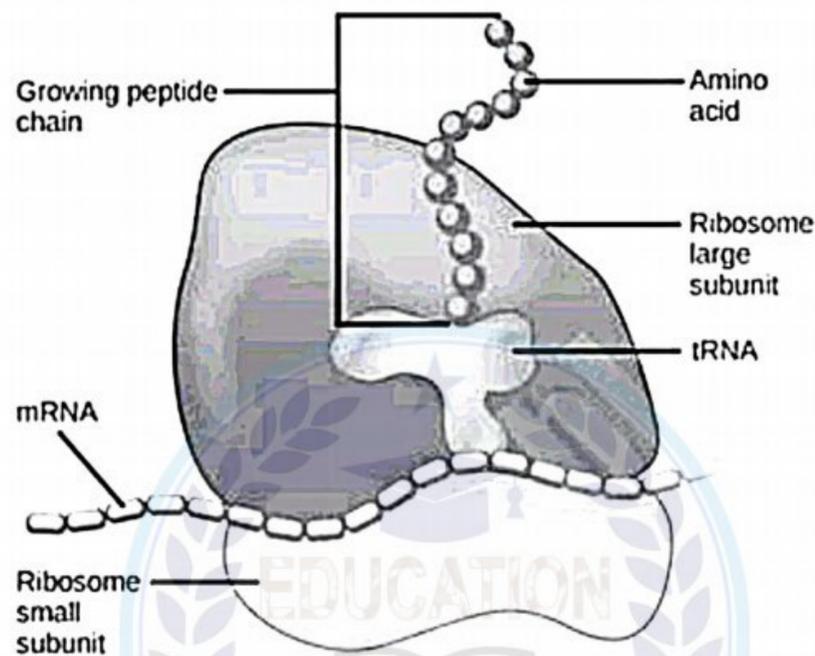
**Q.32: Describe the structure and function of Ribosomes.**

**Ans:** **Ribosomes:** They are tiny granular structures which are not bounded by membrane. They are composed of RNA and protein. Ribosomes may occur singly in the cytoplasm or in groups or may be attached to the endoplasmic reticulum thus forming the rough endoplasmic reticulum.

**Function:** They occur in the cytoplasm and are the sites where protein synthesis occurs. Therefore, they are called protein factories of the cell.



**Diagram of Ribosome**

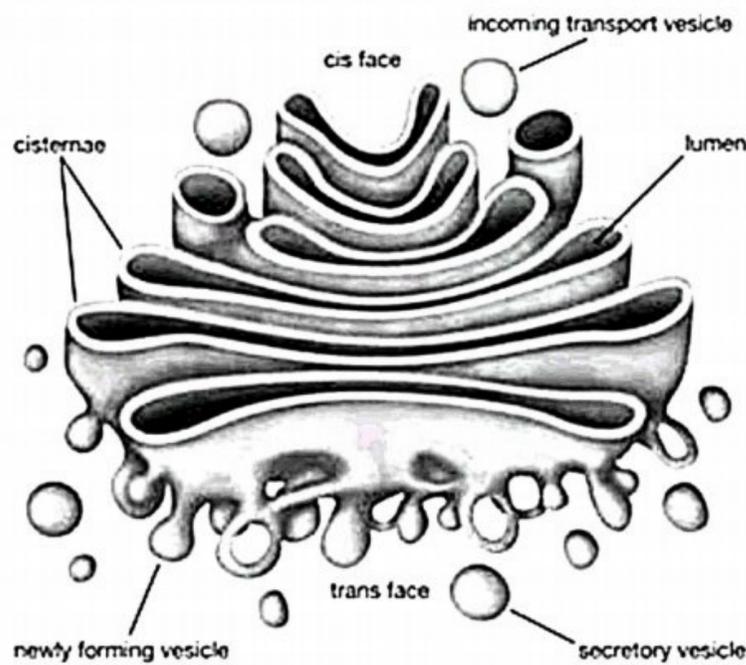


**Q.33: Write a note on Golgi Body.**

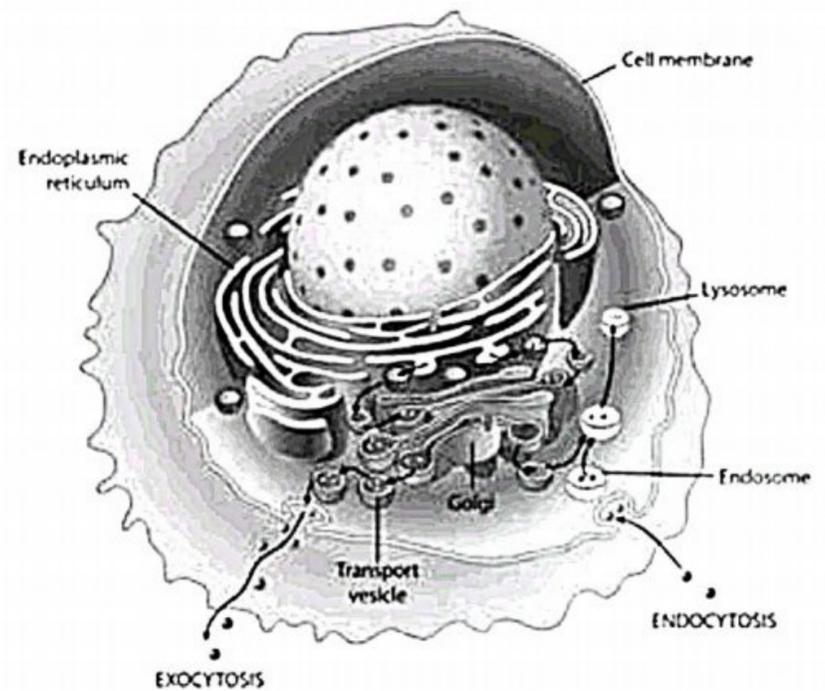
**Ans:** **Golgi Body:** The Golgi body was discovered by the Italian physician Camillo Golgi. It was one of the first organelles to be discovered and described in detail because its large size made it easier to observe. It is important for proteins to be transported through Golgi body from where they are synthesized to where they are required in the cell. The Golgi body is the sorting organelle of the cell.

The Golgi body consists of a stack of flat membrane-bound sacs called cisternae. The cisternae within the Golgi body consist of enzymes which modify the packaged products of the Golgi body.

**Function:** Proteins are transported from the rough endoplasmic reticulum (RER) to the Golgi. In the Golgi, proteins are modified and packaged into vesicle. The Golgi body therefore receives proteins made in one location in the cell and transfers these to another location within the cell where they are required. For this reason the Golgi body can be considered to be the 'post office' of the cell.



**Golgi Apparatus**

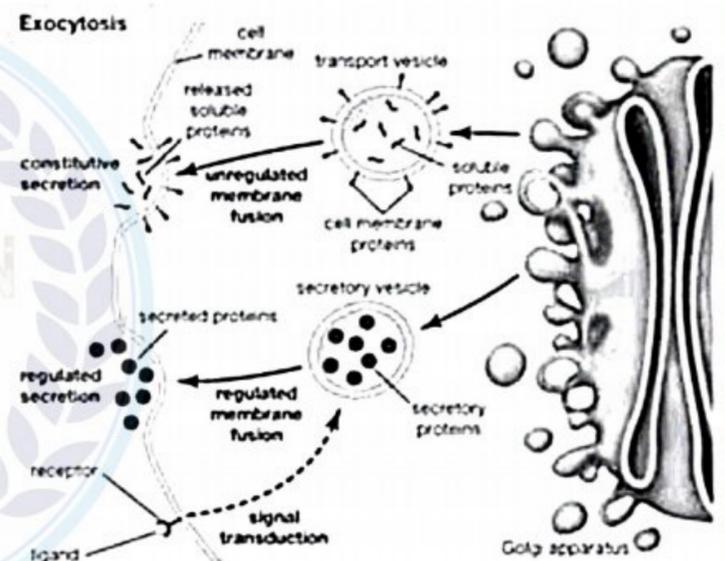


**Golgi Body in a Cell**



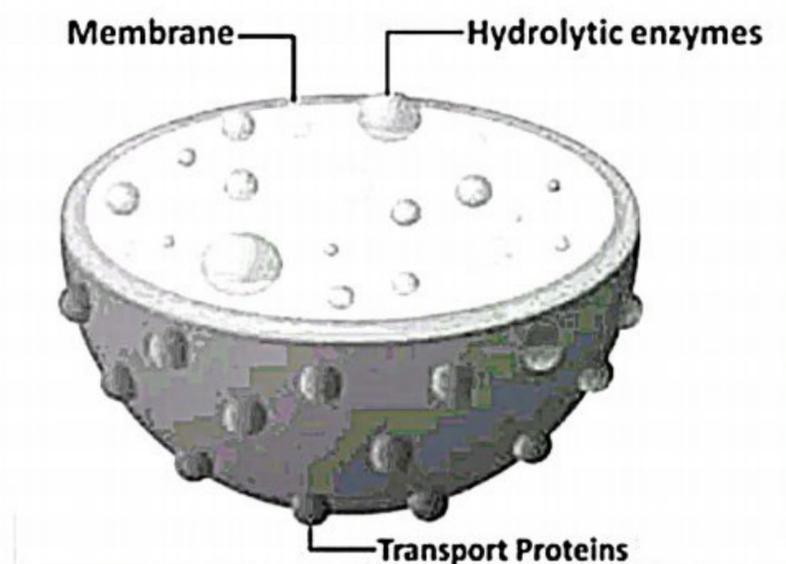
**Q.34: What do you know about vesicles?**

Ans. **Vesicles:** They are small, membrane bound spherical sacs which facilitate the metabolism, transport and storage of molecules. Many vesicles are made in the Golgi body and the endoplasmic reticulum, or are made from parts of the cell membrane. Vesicles can be classified according to their contents and function. Transport vesicles transport molecules within the cell.



**Q.35: Write few lines about Lysosomes**

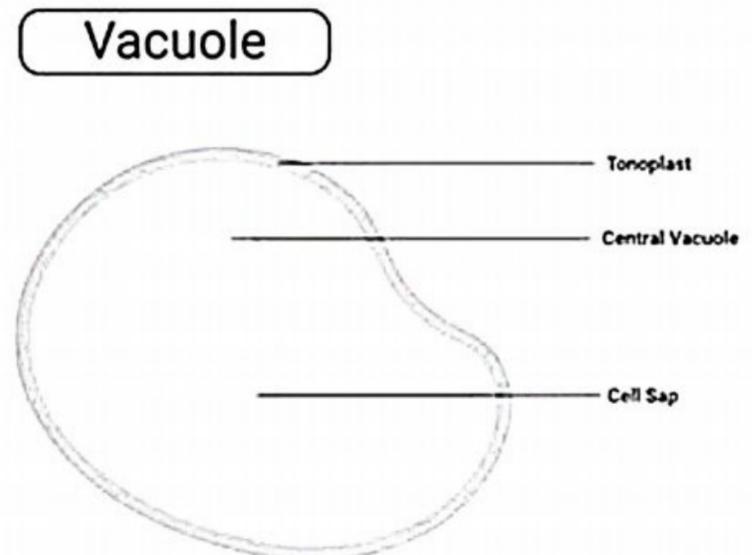
Ans: **Lysosomes:** They are formed by the Golgi body and contain powerful digestive enzymes that can potentially digest the cell. These powerful enzymes can digest cell structures and food molecules such as carbohydrates and proteins. Lysosomes are abundant in animal cells that ingest food through food vacuoles. When a cell dies, the lysosome releases its enzymes and digests the cell.



**Q.36: Explain the structure and function of Vacuoles.**

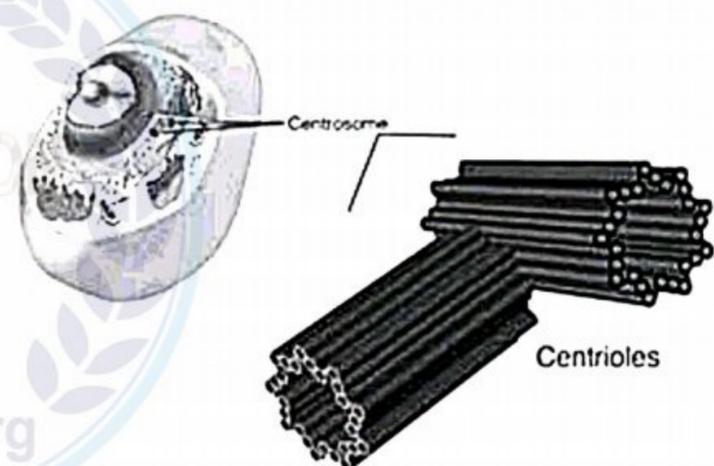
Ans: **Vacuoles:** Vacuoles are fluid-filled spaces that occur in the cytoplasm of plant cells, but are very small or completely absent in animal cells. Plant cells generally have one large vacuole that takes up most of the cell's volume in mature cell. A selectively permeable boundary called the tonoplast, surround the vacuole. The vacuole contains cell sap which is a liquid consisting of water, mineral salts, sugars and amino acids.

**Function:** The vacuole plays an important role in hydrolysis, excretion of cellular waste, substances.



**Q.37: Explain the structure and function of Centrioles.**

Ans. **Centrioles:** Animal cells contain a special organelle called a centriole. The centriole is a cylindrical tube-like structure that is composed of 27 microtubules arranged in a very particular pattern of triplets in rows. The site where two centrioles arranged perpendicular to each other are referred to as a centrosome. The centrosome plays a very important role in cell division. The centrioles are responsible for organizing the microtubules that position the chromosomes in the correct location during cell division.

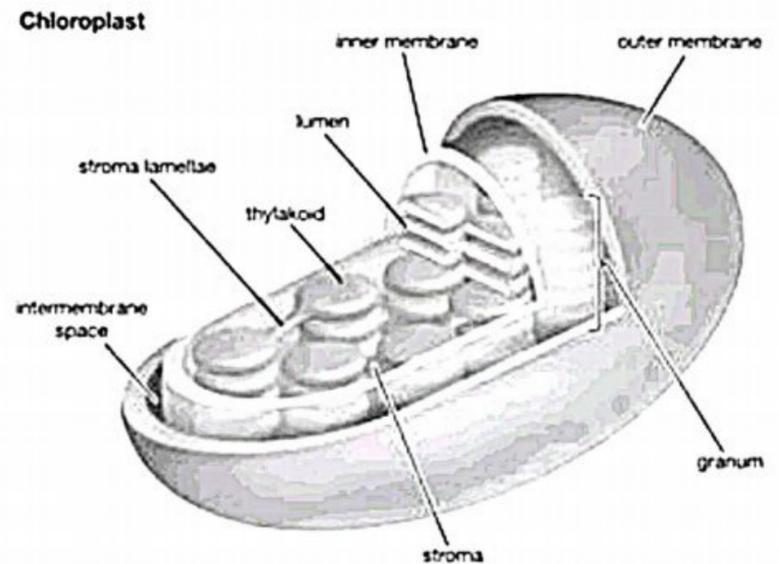


**Q.38: Define Plastids and its types.**

Ans: **Plastids:** Plastids are large cytoplasmic and major organelles found in the cells of plants and algae. Plastids are the site of manufacture and storage of important chemical compounds used by the cell. Plastids often contain pigments used in photosynthesis, and the types of pigments present can change or determine the cell's colour. There are different types of plastids:

- (i) Chloroplast
- (ii) Chromoplast
- (iii) Leucoplast

- (i) **Chloroplasts:** This is the most important type of plastid. Green-coloured plastids found in plants and algae. These are present in the green parts of the plant particularly in leaves. The chloroplast is a double-membraned organelle. Within the double membrane is a gel-like substance called stroma. Stroma contains enzymes for photosynthesis. Suspended in the stroma are stack like structures called grana (singular=granum). Each granum is a stack of thylakoid discs. The chlorophyll molecules (green pigments) are found on the surface of the thylakoid discs.



**Function:** Chlorophyll absorbs energy from the sun for photosynthesis and manufacture carbohydrates by the process of photosynthesis.



- (ii) **Chromoplasts:** They have coloured pigments other than green such as red, orange or yellow. These are present in the petals of the flower, in the ripened fruit pigments, flowers of autumn leaves and other coloured parts of plant.

**Function:** Their function is to help the plant in pollination and dispersal of fruits.

- (iii) **Leucoplasts:** They are colourless, triangular and tabular or of any other shape plastids. They are found in the cells of underground parts of plants.

**Function:** They store food in roots in the form of starch.

**Q.39: Why iodine used to stain the onion peel?**

Ans. Iodine is often used to stain onion cells before microscopic examination to enhance the visibility of the cell. It is used in staining cells of an onion peel on the slide due to following reason.

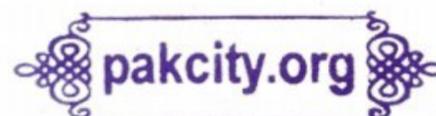
- Onion bulb is made up of scaly leaves which store starch granules in their cytoplasm of the cells.
- Iodine binds to starch in the granules and develops blue black colour.
- This procedure of staining onion cells with iodine makes the onion cells visible clearly. It also confirms the fact that onion stores reserve food material in the form of starch.

**Q.40: Why cell membrane is semipermeable in nature?**

Ans. Plants and animals are made up of cells. It is here that we find the most common example of a semipermeable membrane in action - a process called osmosis. Cells are surrounded by membranes. These membranes are made up of phospholipids (a type of lipid or fat) and proteins. Cell membranes are semipermeable, which means molecules can move through them. This is pretty important for cells to survive.

**Q.41: What is the difference between cell wall and cell membrane?**

Ans. Difference between cell wall and cell membrane



	Cell Wall	Cell Membrane
1.	It is the outer most boundary of plant cells, bacterial cells and fungal cells.	It is the membrane which surrounds cytoplasm, but in plant cell it is surrounded by cell wall.
2.	It is mainly composed of cellulose and pectin.	It is mainly composed of lipids and proteins.
3.	It is made up of three main layers primary wall, middle lamella, secondary wall.	It is made up of protein and lipid bilayer in which protein molecules float.
4.	It is permeable membrane. It gives definite shape and rigidity to plant.	It is selectively permeable membrane; In animal cells infolds of cell membrane take in materials in the form of vacuole.

**Q.42: Write the differences between Mitochondria and Plastids.**

Ans. Differences between Mitochondria and Plastids

	Mitochondria	Plastids
1.	Mitochondria are found in both animal and plant cells.	Plastids are found in the cells of higher plants.
2.	They do not contain pigments.	They contain different types of pigments.
3.	They produce energy.	They capture (use) energy.
4.	They contain enzymes which break the food.	They do not contain enzymes.
5.	They help in respiration.	They help in photosynthesis.
6.	They have no types.	There are three types of plastids.

**Q.43: Distinguish between Lysosome and Ribosomes.**

Ans: Difference between Lysosome and Ribosome.

	Ribosomes	Lysosomes
1.	They are found in both prokaryotic and eukaryotic cells (plant and animal cells).	They are found only in eukaryotic cells or animal cells.
2.	It is not enclosed by a membrane.	It is enclosed by a membrane.
3.	It is comparatively smaller in size than lysosomes, its size ranges from 20 to 30 nm.	It is larger in size than ribosomes, It size ranges from 0.1 to 1.2 micrometer.
4.	It is made of rRNA and ribosomal proteins.	It is made of membrane proteins and digestive enzymes.
5.	It can be found in the cytoplasm either bound to the endoplasmic reticulum or scattered in the cytoplasm.	It is evenly distributed in the cytoplasm. 
6.	It has two subunits: small and large subunit.	It lacks the segments.
7.	It is actively involved in the translation of mRNAs.	It is involved in intracellular digestion.
8.	It is a macromolecule.	It is a cell organelle.
9.	It plays an important role in protein synthesis.	It plays an important role in intracellular digestion and destroys the dead cells.

**Q.44: Explain cell size and shape and relate them with its surface area and volume ratio.**

Ans: Volume Ratio: Cells are microscopic mostly because of this constraint; there are some physiological limits to how big a cell can grow. The scale, or size of a cell compared to other objects, is incredibly small.

The smallest cells are bacteria called mycoplasmas, with diameter between 0.1 $\mu$ m to 1.0 $\mu$ m. The bulkiest cells are bird eggs, and the longest cells are some muscle cells and nerve cells. Most cells lie between these extremes. Cell size and shape are related to cell function. Bird eggs are bulky because they contain a large amount of nutrient for the developing young. Long muscle cells are efficient in pulling different body parts together. Lengthy nerve cells can transmit messages between different parts of body. On the other hand, small cell size also has many benefits. For example human red blood cells are only 8  $\mu$ m in diameter and therefore can move through our tiniest blood vessels i.e. capillaries. Most cells are small in size. In relation of their volumes, large cells have less surface area as compared to small cells. The given figure shows this relationship using cube-shaped

cells. The figure shows 1 large cell and 27 small cells. In both cases, the total volume is same.

$$\text{Volume} = 30 \mu\text{m} \times 30 \mu\text{m} \times 30 \mu\text{m} = 27,000 \mu\text{m}^3$$

In contrast to the total volume, the total surface areas are very different. Because a cubical shape has 6 sides, its surface area is 6 times the area of 1 side.

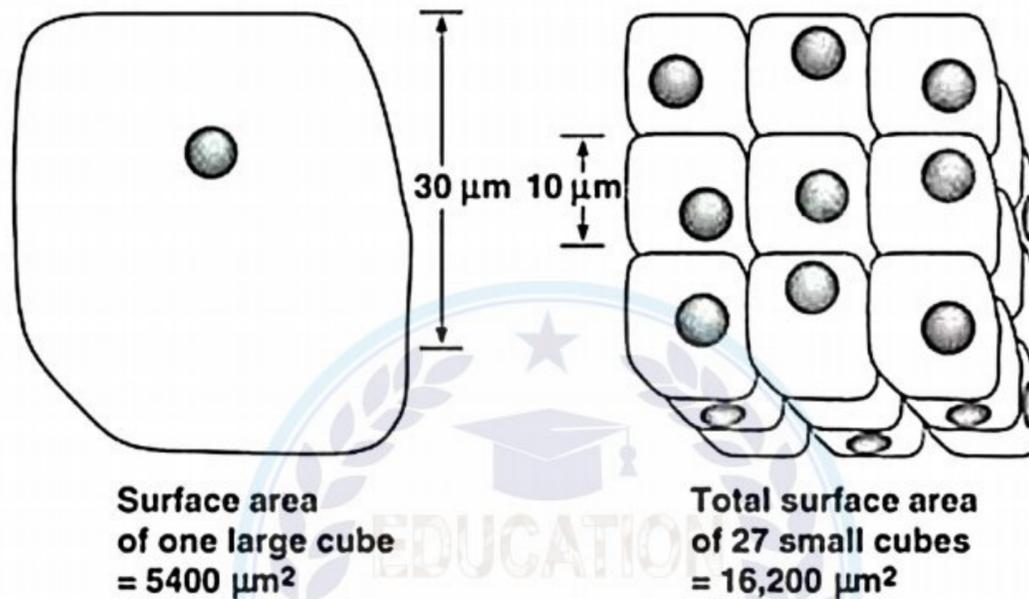


The surface areas of cubes are as follows:

$$\text{Surface area of 1 large cube} = 6 \times (30 \mu\text{m} \times 30 \mu\text{m}) = 5400 \mu\text{m}^2$$

$$\text{Surface area of small cube} = 6 \times (10 \mu\text{m} \times 10 \mu\text{m}) = 600 \mu\text{m}^2$$

$$\text{Surface area of 27 small cubes} = 27 \times 600 \mu\text{m}^2 = 16,200 \mu\text{m}^2$$



**Cell Size and Volume Ratio:** Waste production and demand of nutrients are directly proportional to cell volume. Cell takes up nutrients and excretes waste through its surface cell membrane. So a large volume cell demands large surface area but as the figure shows, a large cell has a much smaller surface area relative to its volume than smaller cells have. Each internal region of the cell has to be served by part of the cell surface. As a cell grows bigger, its internal volume enlarges and the cell membrane expands. Unfortunately, the volume increases more rapidly than does the surface area, and so the relative amount of surface area available to pass materials to a unit volume of the cell steadily decreases. Hence we conclude that the membranes of small cells can serve their volumes more easily than the membrane of a large cell.

In life sciences it is important to note that whenever a structure has an increased surface area, there is an increase in the functioning of that structure.

### Activity 1: Examining Plant Cells Under the Microscope:

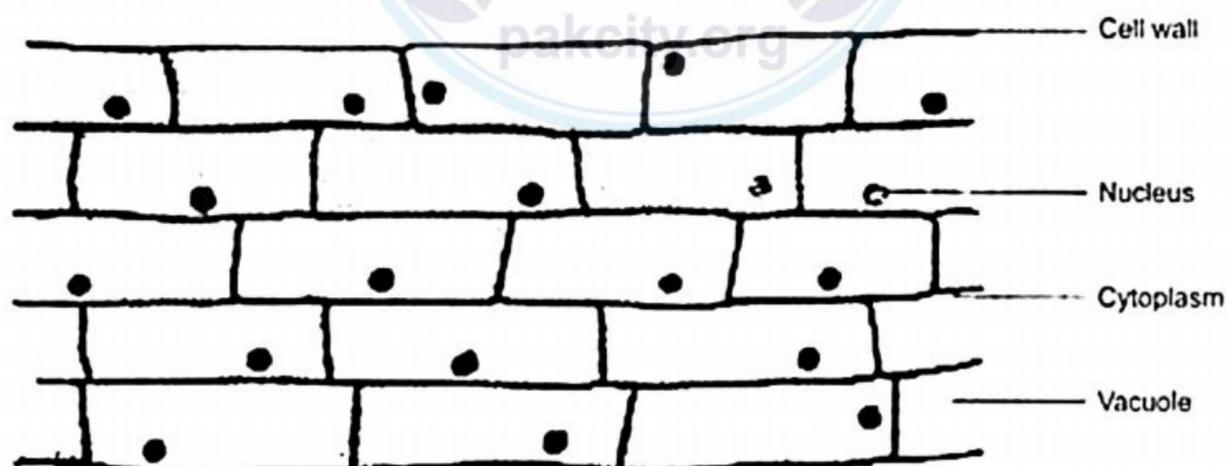
To study the microscopic structures of plant cells.

#### **Apparatus:**

- |               |                               |                          |
|---------------|-------------------------------|--------------------------|
| * Onion       | * Blade                       | * Slides and cover slips |
| * Brushes     | * Tissue paper                | * Compound microscope    |
| * Forceps     | * Dropper                     | * Iodine solution        |
| * Watch glass | * Petri dish containing water |                          |

#### **Procedure:**

1. Peel off the outer most layer of an onion carefully, using a pair of forceps.
2. Place the peeled layer in a watch glass containing water. Make certain that the onion peel does not roll or fold.
3. Using a scalpel or a thin blade, cut a square place of the onion peel (about  $1\text{cm}^2$ ).
4. Remove the thin transparent skin from the inside curve of a small piece of raw onion and place it on a drop of iodine solution on a clean slide.
5. Cover the peel with a cover slip ensuring that no bubbles are formed.
6. Using a piece of tissue paper wipe off any excess iodine solution remaining on the slide.
7. Observe the onion skin under low power of the microscope and then under high power.
8. Draw a neat diagram of 5-10 cells of the typical cells you can see.



### Activity 2: Examining Animal Cells Under the Microscope:

To study the microscopic structures of human cheek cells under a compound microscope.

#### **Apparatus:**

- \* Cotton bud
- \* Clean slide
- \* Methylene blue
- \* Dropper
- \* Water
- \* Tissue paper
- \* Forceps
- \* Microscope

#### **Procedure:**

1. Place a drop of water on a clean glass slide.
2. Using a clean ear bud, wipe the inside of your cheek. The ear bud will collect a moist film.
3. Spread the moist film on a drop of water on a clean glass slide, creating a small smear on the slide.
4. Use a cover slip to cover the slide gently.
5. Place one or two drops of stain on the side of the cover slip.
6. Use a piece of tissue to remove the excess dye.
7. Observe the cheek cells under low power magnification and then under high power magnification.

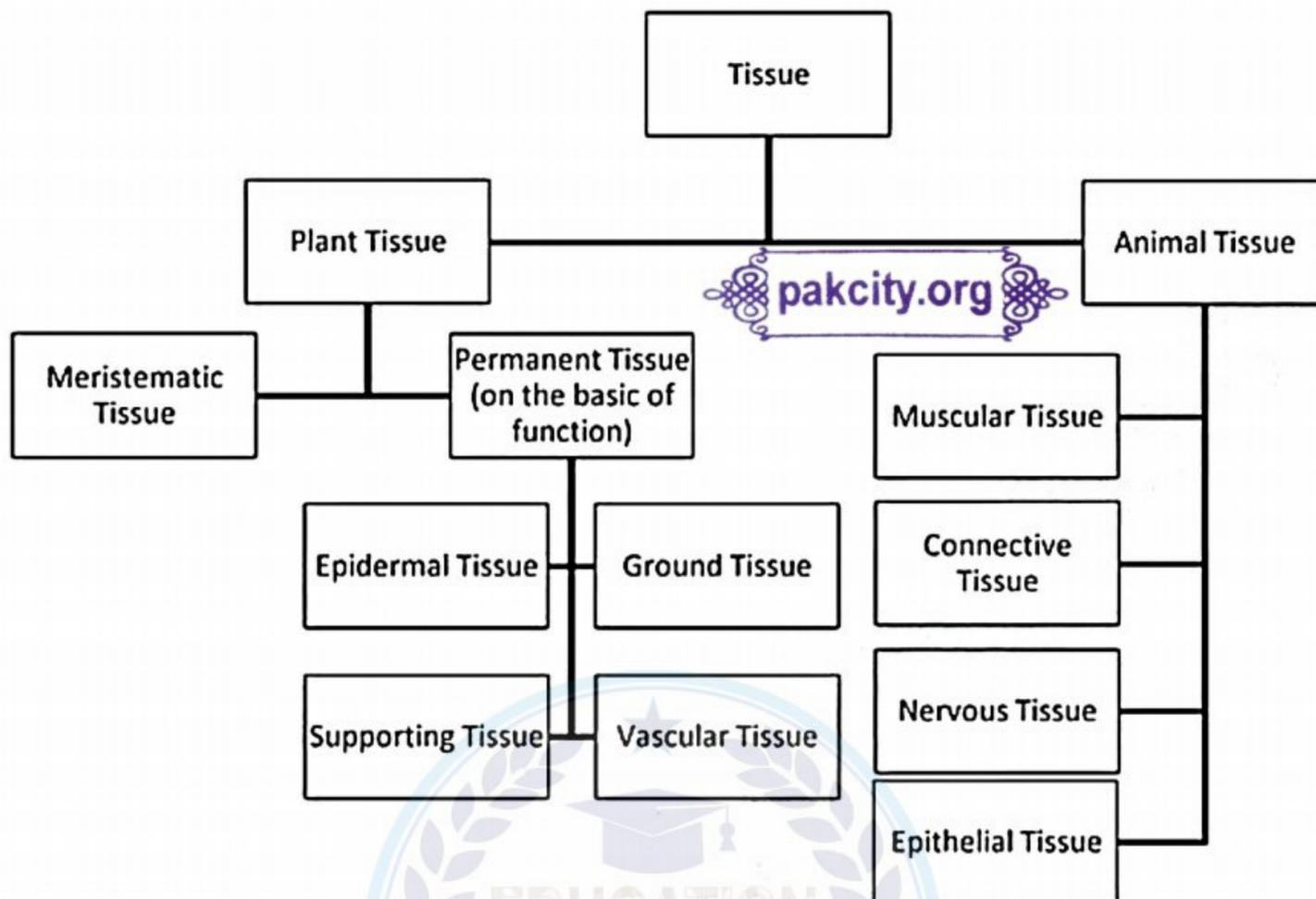


#### **Questions:**

1. What are the shapes of epidermal cells of onion peel and the human cheek cells?
2. Why is iodine used to stain the onion peel?
3. What is the difference between the arrangement of cells in onion cells and in human cheek cells?
4. Why is a cell considered the structural functional unit of living things?

**Q.45: What is tissue? And mention the types of tissue.**

**Ans:** Tissue: A group of cells which are similar in structure and function is called tissue.



**Q.46: Name the types of animal tissues.**

**Ans:** Animal Tissues: Humans and other large multicellular animals are made up of four basic types of tissue:

- (i) Epithelial tissue
- (ii) Connective tissue
- (iii) Muscular tissue, and
- (iv) Nervous tissue.

**Q.47: Describe the types of Epithelial Tissue in detail.**

**Ans.** Epithelial Tissue : Epithelial Tissue covers the surface of the body, lines the spaces inside the body and forms glands For instance, the outer layer of our skin is an epithelial tissue and the lining of small intestine is made up of epithelial tissues.

Epithelial cells are polarized, means that they have a top and a bottom side. There are different types of epithelial tissue depending on their function in a particular location. The simplest classification of these tissues is based on the number of cell layers.

Simple Epithelial Tissue: When the epithelium is composed of a single layer of called simple epithelial tissue.

- (i) **Simple Squamous Epithelium**: It is found in the alveoli of lungs, and its structure is important for the exchange of gases between the blood and lungs.

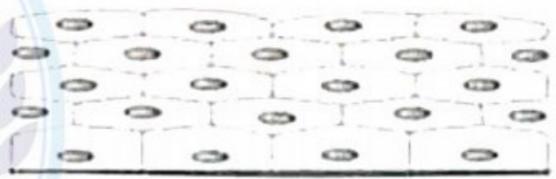
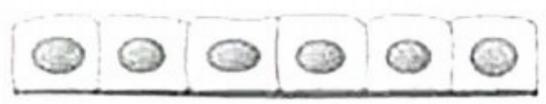
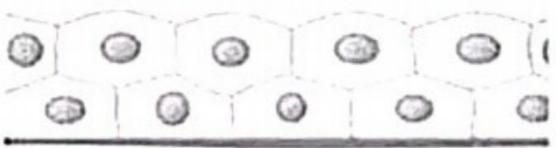
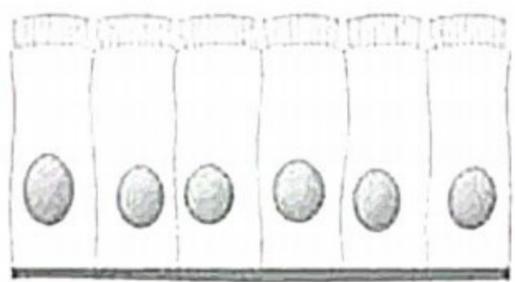
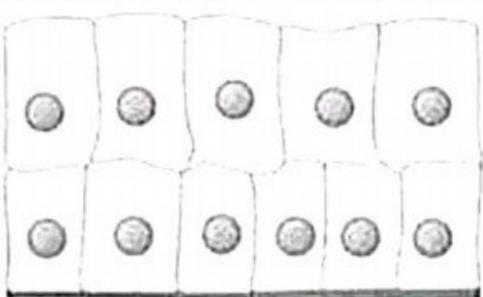
- (ii) **Simple Cuboidal Epithelia:** They line the lumen of collecting ducts in the kidney and are present in the thyroid gland around the follicles that secrete thyroid hormones.
- (iii) **Simple Columnar Epithelia:** They are found in the female reproductive system and in the digestive tract.



**Stratified Epithelial Tissue:** Stratified epithelia consist of more than one layer of cells and only one layer is in direct contact with the basement membrane.

- (i) **Stratified Squamous Epithelia:** They are found in skin, with many dead, keratinized cells providing protection against water and nutrient loss.
- (ii) **Stratified Cuboidal Epithelia:** They are found surrounding the ducts of many glands, including mammary glands in the breast and salivary glands in the mouth.
- (iii) **Stratified Columnar Epithelia:** They are a rare, found predominantly in some organs of the reproductive system.

**Transitional Epithelia:** They are a special subset of stratified epithelia. They are exclusively found in the excretory system.

	Simple	Stratified
Squamous	 <p>Simple squamous epithelium</p>	 <p>Stratified squamous epithelium</p>
Cubical	 <p>Simple cuboidal epithelium</p>	 <p>Stratified cuboidal epithelium</p>
Columnar	 <p>Simple columnar epithelium</p>	 <p>Stratified columnar epithelium</p>

**Q.48: Describe the Connective Tissue and its types.**

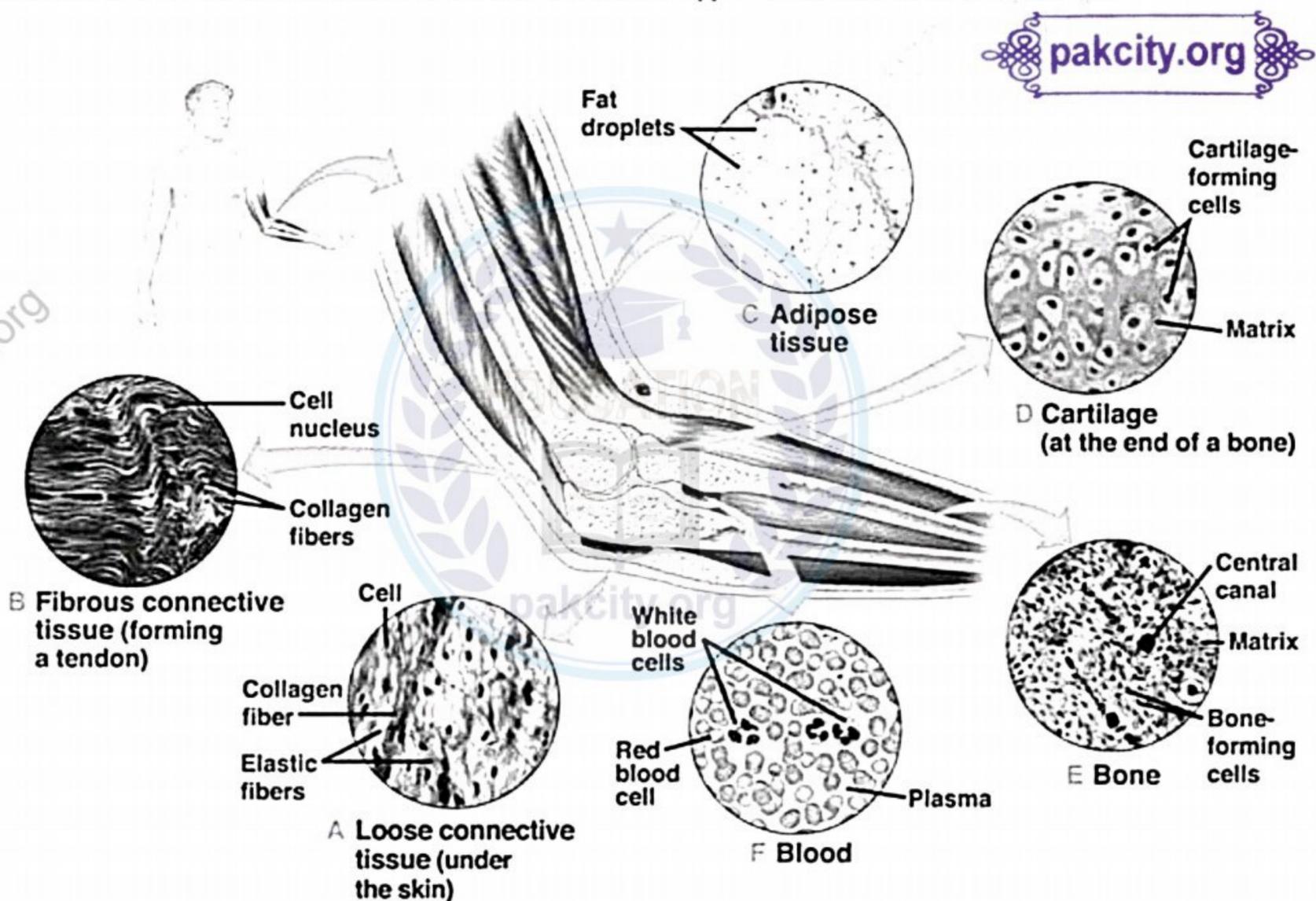
**Ans: Connective Tissue:** This tissue which connects or bind the different types of cells called connective tissues. They also bind other tissues of the body with each other. Connective tissue holds structures in the body together, such as tendons.

**Cartilage:** It is a type of supporting connective tissue. It is a dense connective tissue. Cartilage has limited ground substance and can range from semisolid to a flexible matrix.

**Bone:** It is another type of supporting connective tissue. Bone can either be compact (dense) or spongy (cancellous), and contains the osteoblasts or osteocytes cells.

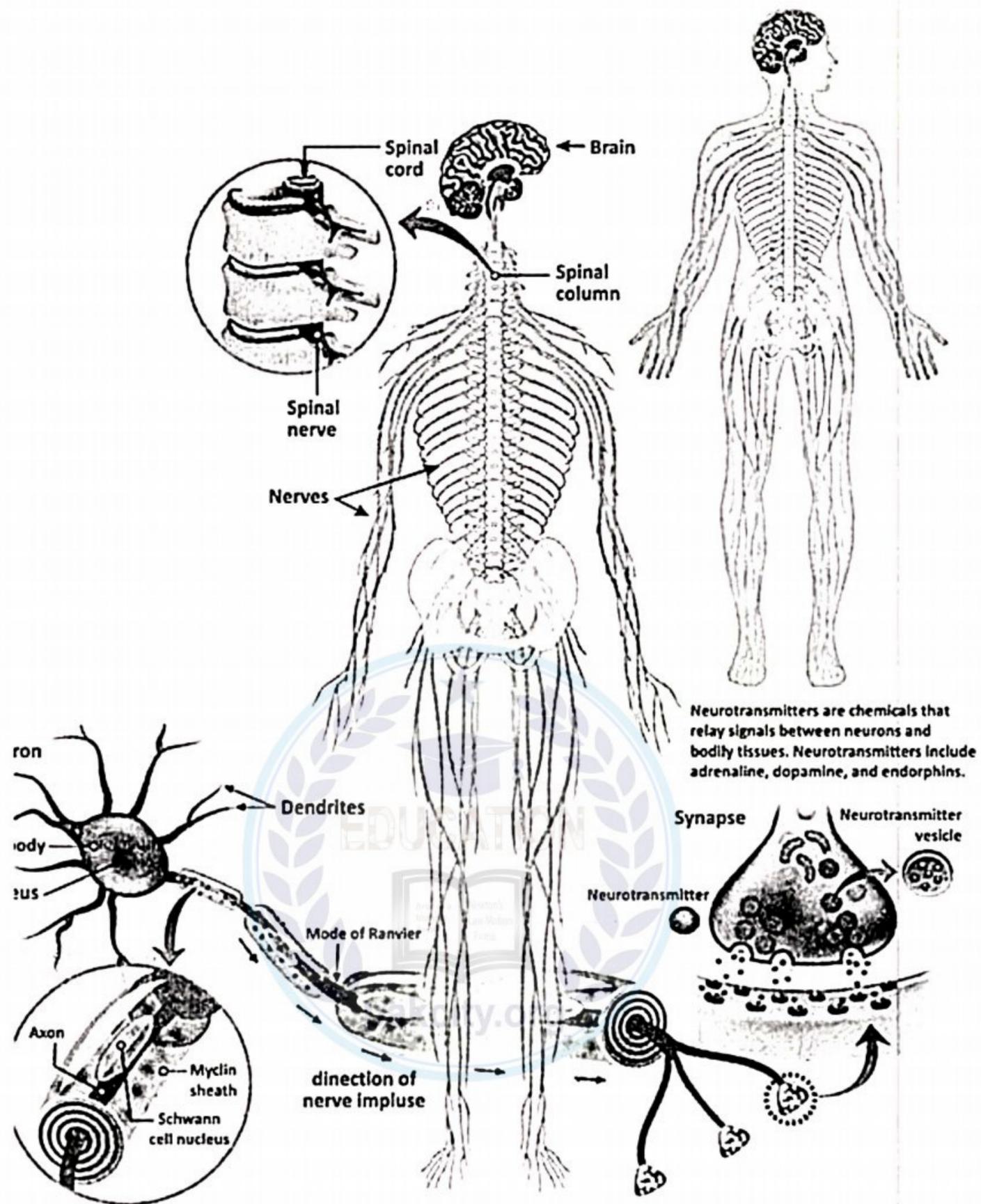
**Adipose:** It is another type of supporting connective tissue that provides cushions and stores excess energy and fat.

**Blood:** It referred to as connective tissue. It is a type of fluid connective tissue.



**Q.49: Write a short note on nervous tissue.**

**Ans: Nervous Tissue:** Nervous tissues are composed of neurons, which transmit information to other cells. Nervous tissue is found in the brain, spinal cord, and nerves. It is responsible for coordinating and controlling many body activities. It stimulates muscle contraction, creates an awareness of the environment, and plays a major role in emotions, memory, and reasoning. To do all these things, cells in nervous tissue need to be able to communicate with each other by way of electrical nerve impulses.



**Q.50: What do you know about muscle tissue and its types?**

**Ans. Muscle Tissue:** Muscle tissue contains the cells that are responsible for the contraction of muscles. There are three types of muscular tissues:

- (i) Cardiac                      (ii) Smooth                      (iii) Skeletal



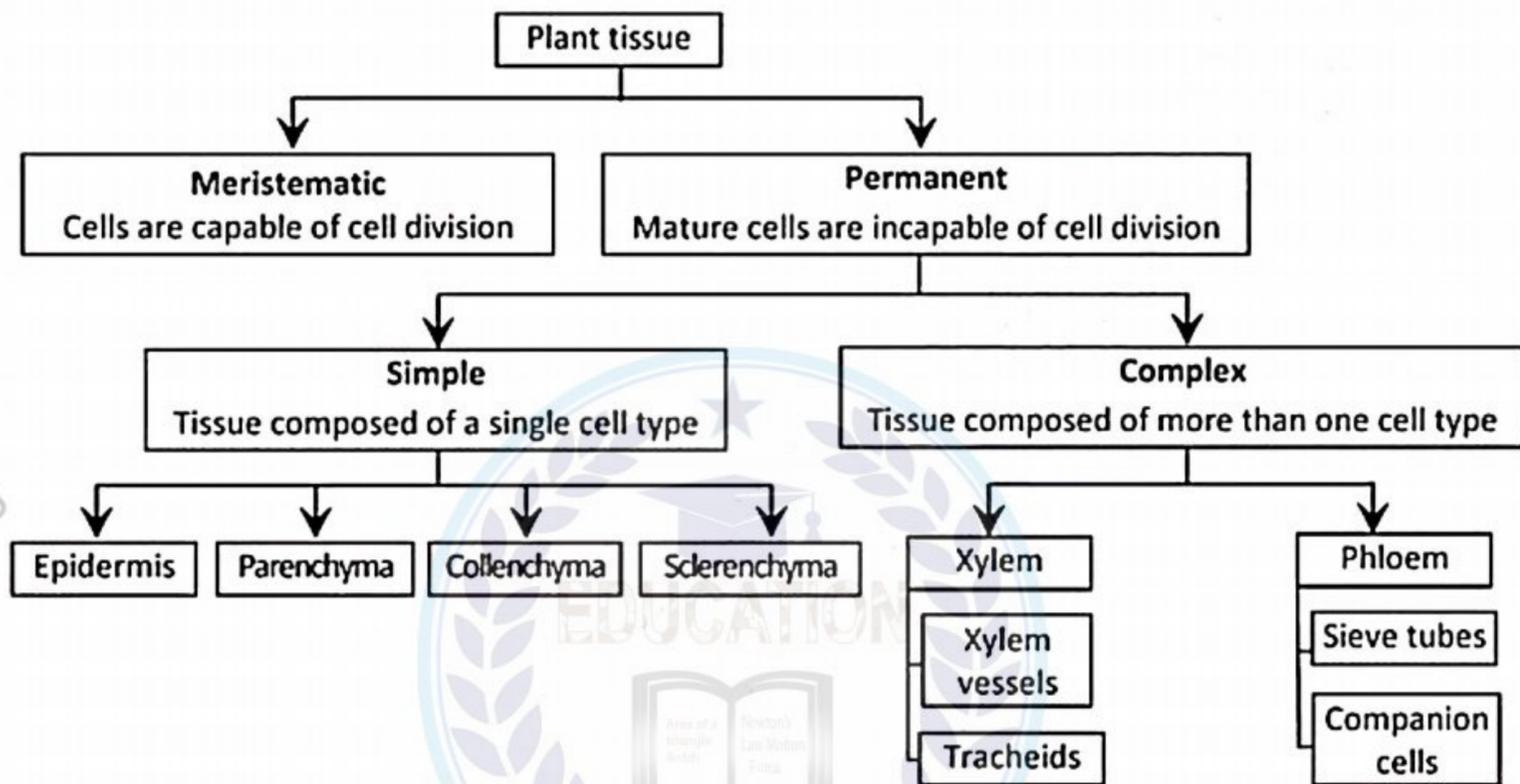
- (i) **Skeletal Muscle:** Skeletal muscle which is also called striated (striped) muscle, is what we refer to as muscle in everyday life. Skeletal muscle is attached to bones by tendons. For instance, the muscles in our legs and our arms are skeletal muscle.

- (ii) **Cardiac muscle:** It is found only in the walls of the heart. Like skeletal muscle, cardiac muscle is striated, or striped. But it's not under voluntary control. It means we don't need to think about making your heart beat.
- (iii) **Smooth muscle:** It is found in the walls of blood vessels, as well as in the walls of the digestive tract, the uterus, the urinary bladder; and various other internal structures. Smooth muscle is un-striated, (unstriated), it is involuntary, not under conscious control.

**Q.51: Draw chart of plant tissues.**



Ans.



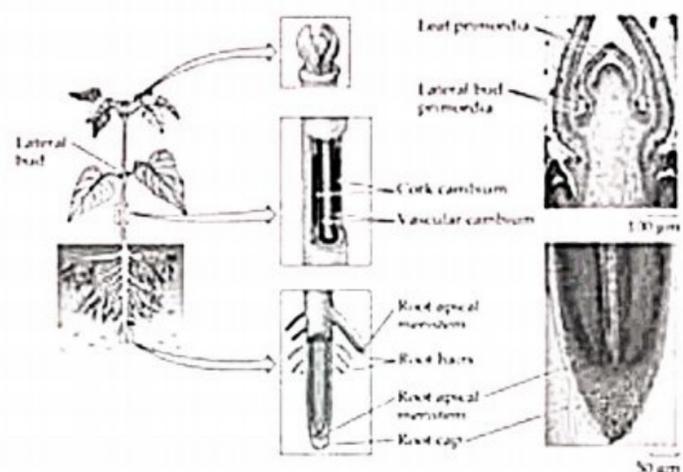
**Q.52: Write down the types of plant tissue.**

Ans: **Plant Tissues:** As same in animals, plant cells are grouped into tissues with characteristics functions such as photosynthesis, transport etc. There are two major categories of tissues in plants:

- (1) Meristematic tissue
- (2) Permanent tissues

(1) **Meristematic Tissue:** These tissues are composed of cells, which have the ability to divide. The cells are thin walled, have large nucleus and number of small vacuoles. Usually they do not have inter-cellular spaces, so the cells are arranged compactly. Two main types of Meristematic tissues are recognized in plants.

**Location of Meristematic Tissues**



- (i) **Apical Meristems:** These tissues are present at the apex of roots and stems. According to their position they are Apical meristems. Stem and root increase in length by the division of cells of these tissues. This type of growth is called primary growth.
- (ii) **Lateral meristems:** These tissues are located on the lateral sides of roots and shoot. By dividing, they are responsible for increase in growth of plant parts. This growth is called secondary growth.

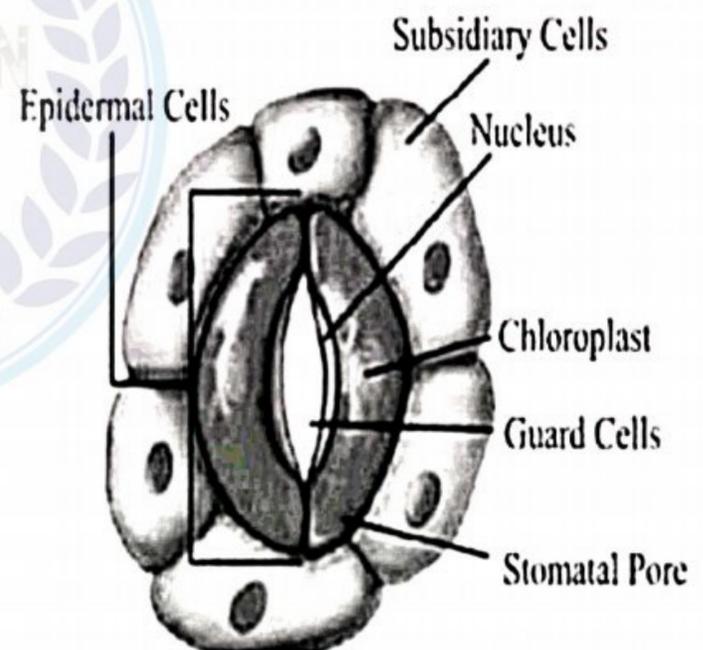


(2) **Permanent Tissues:** Permanent tissues originate from Meristematic tissue. The cells of these tissues do not have the ability to divide and may have intercellular spaces in between cells. They are further classified into following types: either on the basis of position or composition. There are two types of permanent tissues

- (a) Simple permanent tissue
- (b) Compound or complex tissue.

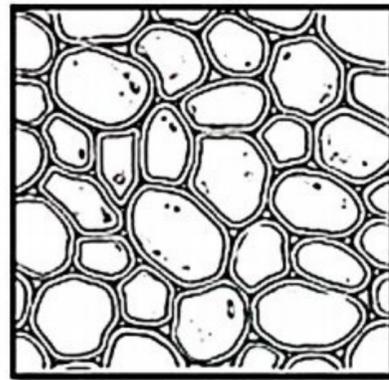
(a) **Simple Permanent Tissues:** Simple permanent tissues are made up of only one type of cell.

(i) **Epidermal Tissues:** Epidermal tissues are composed of a single layer of cells and they cover plant body. They act as a barrier between environment and internal plant tissues. In roots, they are also responsible for the absorption of water and minerals. On stem and leaves they secrete cutin (the coating of cutin is called cuticle which prevents evaporation. Epidermal tissues also have some specialized structure that perform specific functions; for example root hairs and stomata.

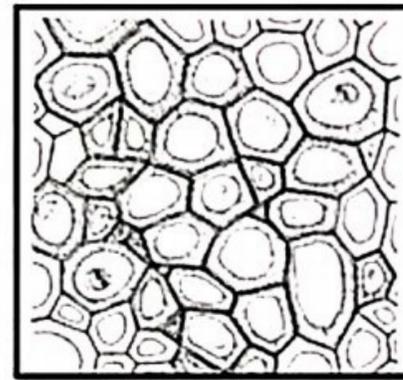


(ii) **Ground Tissues:** Ground tissues are simple tissues made up of parenchyma cells. Parenchyma cells are the most abundant cells in plants. Overall they are spherical but flat at point of contact. They have thin primary cell walls and have large vacuoles for storage of food. In leaves, they are called mesophyll and are the sites of photosynthesis. In other parts, they are the sites of respiration and protein synthesis.

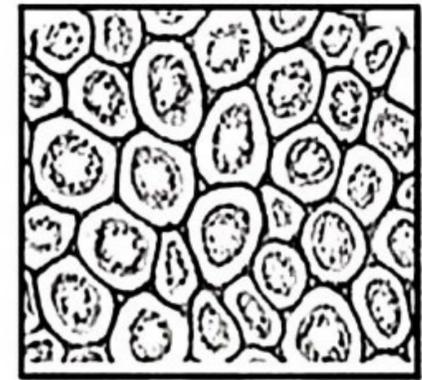
(iii) **Supporting Tissues:** These tissues provide strength and flexibility to plants. They are further of two types.



Parenchyma



Sclerenchyma



Chlorenchyma

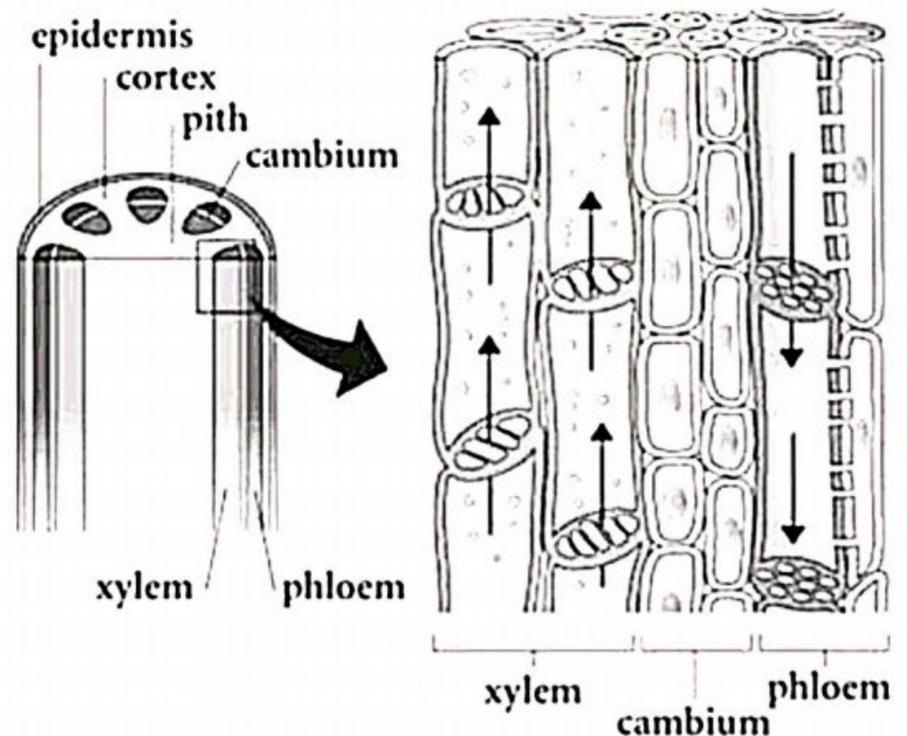
(a) **Collenchyma Tissues:** They are found in cortex (beneath epidermis) of young stems and in the midribs of leaves and in petals of flowers. They are made of elongated cells with unevenly thickened primary cell walls. They are flexible and function to support the organs in which they are found.

(b) **Sclerenchyma Tissues:** They are composed of cells with rigid secondary cell walls. Their cell walls are hardened with lignin, which is the main chemical component of wood. Mature sclerenchyma cells cannot elongate and most of them are dead.



(b) **Compound (Complex) Tissues:** A plant tissue composed of more than one type of cell is called a compound or complex tissue. Xylem and phloem tissues, found only in vascular plants, are examples of compound tissues.

(i) **Xylem Tissues:** Xylem tissue is cambium responsible for the transport of water and dissolved substances from roots to the aerial parts. Due to the presence of lignin, the secondary walls of its cells are thick and rigid. That is why xylem tissue also provides support to plant body. Two main types of cell are found in xylem tissue i.e. vessel and tracheids.



Vessels have thick secondary cell walls. Their cells lack end walls and join together to form long tubes. Tracheids are made up of slender cells with overlapping ends.

(ii) **Phloem Tissues:** Phloem tissue is responsible for the conduction of dissolved organic matter (food) between different parts of plant body. Phloem tissue mainly contains sieve tube cells and companion cells. Sieve tube cells are long and their end walls have small pores. Many sieve tube cells join to form long sieve tubes. Companion cells are parenchymatous, narrow, elongated cells, and are closely associated with the sieve tube. Conduction with the sieve tube is done through the pores present on the walls of these cells. They help the sieve tubes in conduction of food materials and make proteins for sieve tube cells.



## Chapter = 04

Biology 9th- Short Question Answers

# → CELLS AND TISSUES

**Q.1: What is Cell?**

**Ans: Cell:** "All living organisms are composed of cells. It is the basic structural and functional unit of life. It is a set of organelles made up of proteins, carbohydrates, lipids and nucleic acids."

**Q.2: What is a microscope? How many parameters are important in microscopy?**

**Ans: Microscope:** Microscopes are instruments designed to produce magnified visual or photographic images of objects too small to be seen with the naked eye.

**Q.3: Who invented the microscope?**

**Ans:** Zacharias Janssen is generally believed to be the first investigator to invent the compound microscope in the 1590s. It was simply a tube with lenses at each end and its magnification ranged from 3X to 9X.

**Q.4: How can we calculate the total magnification of a compound light microscope?**

**Ans:** In order to ascertain the total magnification when viewing an image with a compound light microscope, take the power of the objective lenses, which is at 4x, 10x, 40x and multiply it by the power of the eye piece which is typically 10x. Therefore, a 10x eyepiece used with a 10x objective lens will produce a magnification of 100x. This means that the object can be magnified, 40x, 100x or 400x.



**Q.5: Compare resolution with magnification.**

**Ans.**

	Resolution	Magnification
1.	Resolution is the capacity to separate adjacent objects.	Magnification is a means of increasing size of the object.
2.	Resolution is maintained upto certain magnification.	By increasing magnification resolution is disturbed.
3.	Resolution improves with the wave length of light.	Magnification improves with the focal length of the light.

**Q.6: Write the differences between light microscope and electron microscope.**

**Ans: Differences Between Light Microscope And Electron Microscope**

	Light Microscope	Electron Microscope
1.	These microscopes use visible light as the source of illumination.	These microscopes use a beam of electrons as a source of illumination.
2.	Light microscope uses glass lenses for magnification.	It uses electromagnetic lenses instead of glass lenses.
3.	The image of the specimen is projected into the human eye.	The image cannot focus in human eye, therefore, screen or photographic plates are used to review and focus the image.
4.	It achieves a resolution above 0.2m. 	It achieves a resolution of about 0.2nm, a thousand times improvement over light microscope.

**Q.7: Who discovered the nucleus?**

**Ans:** In 1833, Robert Brown, an English botanist, discovered a spherical body called nucleus in the cell of orchids.

**Q.8: Describe the cell as a structural and functional unit of life.**

**Ans: Cell as a Structural Unit:**

- (i) All living organisms are composed of cells.
- (ii) Cells are the unit of structure of living organisms or the building block of which living things are made.
- (iii) Cells are of many different shape and sizes.

**Cells as a Functional Unit:**

- (i) Cells have to perform different functions.
- (ii) All basic functional activities, characteristics of living things occur in the cell.
- (iii) Therefore, cell is a unit of function of all living organisms.

**Q.9: What is the composition and function of cytoskeleton?**

**Ans: Cytoskeleton:** A microscopic network of protein consists of microtubules and various filaments that spread out through the cytoplasm. Microtubules are made of tubulin while filaments are made up of actin protein.

***Function:*** It provides both structural support and means of transport within the cell.

**Q.10: Describe the composition and function of cytoplasm.**

Ans: **Cytoplasm:** The cytoplasm is the jelly-like substance that fills the cell. It consists of up to 90% water. It also contains dissolved nutrients and waste products.

**Functions:** Its main function is to hold together the organelles which make up the cytoplasm. It also nourishes the cell by supplying it with salts and sugars and provides a medium for metabolic reactions to occur.



**Q.11: Name the types of animal tissues.**

Ans: **Animal Tissues:** Humans and other large multicellular animals are made up of four basic types of tissue:

- |                            |                        |
|----------------------------|------------------------|
| (i) Epithelial tissue      | (ii) Connective tissue |
| (iii) Muscular tissue, and | (iv) Nervous tissue.   |

**Q.12: Why mitochondria is also called power house of cell?**

Ans: Mitochondria is the site of aerobic respiration. During aerobic respiration energy is produced in the form of ATP. Therefore the mitochondria is also called "Power House" of cell.

**Q.13: Why iodine used to stain the onion peel?**

Ans. Iodine is often used to stain onion cells before microscopic examination to enhance the visibility of the cell. It is used in staining cells of an onion peel on the slide due to following reason.

- Onion bulb is made up of scaly leaves which store starch granules in their cytoplasm of the cells.
- Iodine binds to starch in the granules and develops blue black colour.
- This procedure of staining onion cells with iodine makes the onion cells visible clearly. It also confirms the fact that onion stores reserve food material in the form of starch.

**Q.14: Why cell membrane is semipermeable in nature?**

Ans: Plants and animals are made up of cells. It is here that we find the most common example of a semipermeable membrane in action - a process called osmosis. Cells are surrounded by membranes. These membranes are made up of phospholipids (a type of lipid or fat) and proteins.

**Q.15: How electron microscope is different from simple compound microscope?**

Ans:

	Light Microscope	Electron Microscope
1.	These microscopes use visible light as the source of illumination.	These microscopes use a beam of electrons as a source of illumination.
2.	Light microscope uses glass lenses for magnification.	It uses electromagnetic lenses instead of glass lenses.
3.	The image of the specimen is projected into the human eye.	The image cannot focus in human eye, therefore, screen or photographic plates are used to review and focus the image.
4.	It achieves a resolution above 0.2m. 	It achieves a resolution of about 0.2nm, a thousand times improvement over light microscope.

**Q.16: How facilitated diffusion is different from active transport?**

Ans: Diffusion is the movement of substance from a region of high concentration to low concentration. It is therefore said to occur down a concentration gradient. Diffusion is a passive process which means it does not require any energy input. It can occur across a living or non-living membrane and can occur in a liquid or gas medium.

**Q.17: Why cell is considered as the structural and functional unit of living things?**

Ans: **Cell as a Structural Unit:**

- (i) All living organisms are composed of cells.
- (ii) Cells are the unit of structure of living organisms or the building block of which living things are made.
- (iii) Cells are of many different shape and sizes.

**Cells as a Functional Unit:**

- (i) Cells have to perform different functions.
- (ii) All basic functional activities, characteristics of living things occur in the cell.
- (iii) Therefore, cell is a unit of function of all living organisms.

