Chapter # 3
The Cell

After studying this chapter, students will be able to:

- Describe cell as the basic unit of life.
- Compare with diagrams the structure of animal and plant cells.
- Sketch different sub-cellular organelles and outline their roles.
- Identify different types of cells (mesophyll cell, epidermal cell, neurons, muscle, red blood cell, liver cell) and sketch their structures.
- Describe the concept of division of labour and how it applies within cells (across organelles) and in multicellular organisms (across cells)
- Describe cell specialization. ● Define stem cells as unspecialized cells.

Subject Questions & Answers

3.1 + 3.2 Cell + Structure of Cell

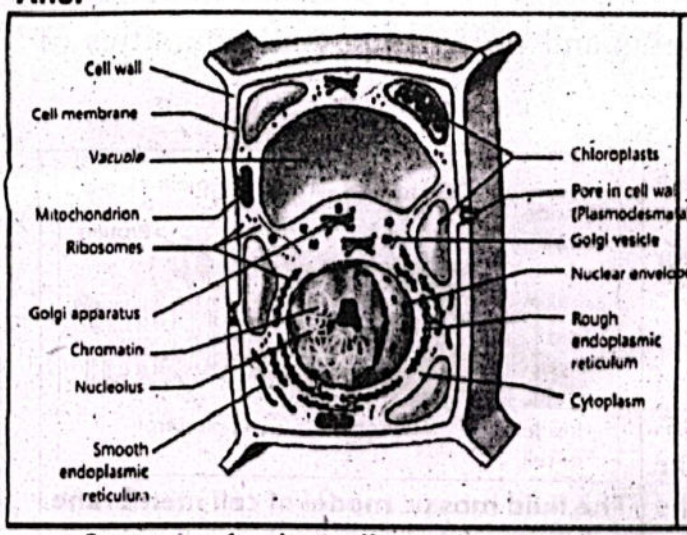
Q.1: What dy you know about Cell?

Ans. Cell: The cell is the basic unit of life. Cells are the building blocks of living organisms, including plants, animals, and humans. Every living thing, from the smallest bacterium to the largest whale, is made of cells.

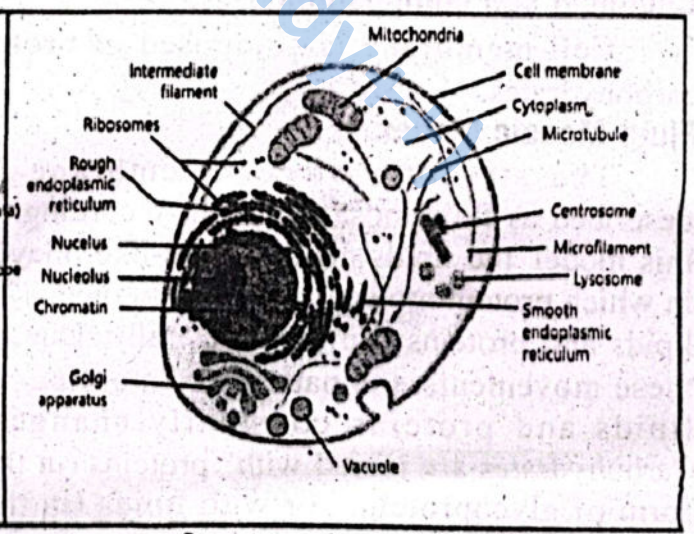
Most of the cells are very small, and cannot be seen with the naked eye. Despite their size, cells are very complex and carry out many essential functions to keep living things alive and functioning.

Q.2: Draw and label the diagrams. (i) Plant Cell (ii) Animal Cell

Ans.



Structure of a plant cell

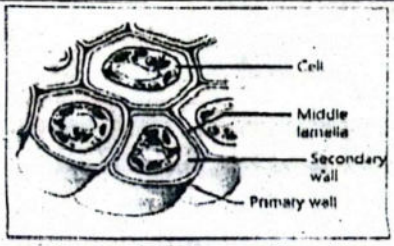


Structure of an animal cell

Q.3: Describe the structure and functions of the cell wall.

Ans. Cell wall:

The cells of bacteria, fungi, plants and some protists have a rigid non-living wall around cell membrane. It is called cell wall.

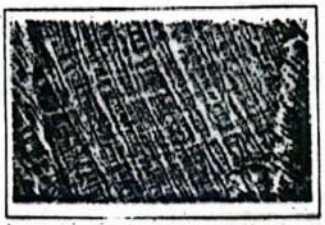


Layers of plant cell wall

Function: It provides shape, strength, protection and support to the inner living matter (protoplasm) of the cell.

Composition of Cell wall:

The plant cell wall is made of three layers i.e. middle lamella, primary wall, and secondary wall.


Cellulose fibresin primary wall

Primary wall: The primary wall is present just above the cell membrane. It is mainly composed of cellulose, hemicelluiose, and pectin. Cellulose forms fibres that crisscross over one another to form strong primary wall.

Middle lamella:

Middle lamella holds together the primary walls of adjacent cells. It contains magnesium, calcium and pectin.

Secondary wall:

Some plant cells e.g., xylem cells make secondary wall on the inner side of primary-wall. It-is mainly made of cellulose, lignin and other chemicals.

The cell wall of algae is also composed of cellulose. The cell wall of prokaryotes is made of peptidoglycan (a single molecule made of amino acids and sugars). The cell wall of fungi is made of chitin.

Q.4: Explain the fluid mosaic model of the cell membrane.

Ans. Cell membrane: All cells have a thin and elastic cell membrane around the cytoplasm. It is selectively-permeable.

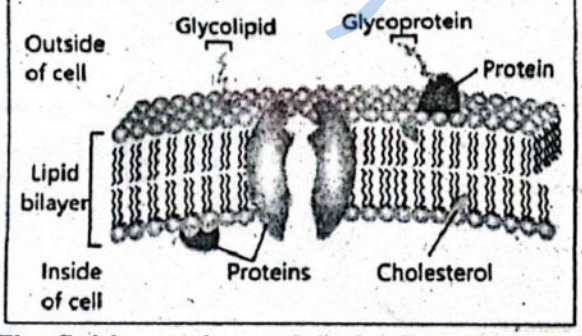
Function: It allows very few molecules to pass through it, while blocks many other molecules.

Chemical cell composition:

Cell membrane is composed of proteins and lipids and small quantities of carbohydrates.

Fluid-Mosaic Model:

The structure of cell membrane is described as fluid-mosaic model. According to this model' the lipids make a fluid-like bilayer in which protein molecules are submerged. The lipids and proteins can move laterally. Due to these movements, the pattern or "mosaic," of lipids and proteins constantly changes. Carbohydrates are joined with" proteins (in the form of glycoproteins) or with lipids (in the form of glycolipids).



The fluid mosaic model of cell membrane

In eukaryotic cell many organelles e.g. mitochondria, chloroplasts, .Golgi apparatus and endoplasmic reticulum are also bounded by membranes.

Q.5: Write a note on cytoplasm.

Ans. Cytoplasm

It is the jelly-like substance that fills the inside of a cell.

Chemical composition:

Cytoplasm is a complex mixture of water, proteins, enzymes, salts, and other substances.

Function:

1. Cytoplasm provides a medium for organelles to move and function.
2. It also helps in the transport of materials throughout the cell.
3. It acts as the site for various metabolic reactions e.g., Glycolysis (breakdown of glucose).
4. It also stores food and wastes of the cell.

Q.6: Discuss the components of the nucleus.

Ans. Nucleus:

A prominent nucleus occurs in eukaryotic cells.

Location:

In animal cells, it is present in the center. In mature plant cells, it is pushed to side due to a large central vacuole.

Nuclear envelope:

The nucleus is bounded by a double membrane known as nuclear envelope. It is semi-permeable and has many small pores called nuclear pores.

Nucleoplasm:

The inner jelly-like material of nucleus is called nucleoplasm. In nucleoplasm, there are one or more small bodies called nucleoli (singular; nucleolus). Here, ribosomes are assembled.

Chromatin:

Nucleoplasm contains fine thread-like material known as chromatin. It is composed of deoxyribonucleic acid (DNA) and proteins.

Chromosomes:

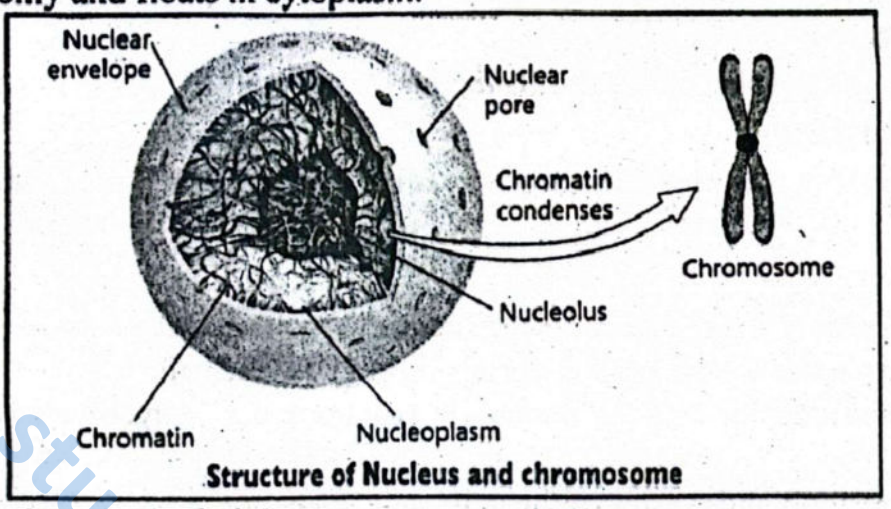
When a cell starts dividing, its chromatin condenses and takes the shape of thick chromosomes.

DNA:

Chromosomes are composed of Deoxysribonucleic acid (DNA) and proteins. DNA contains genes which control all the activities of the cell. DNA is also responsible for the transmission of characteristics to the next generation. That is why it is called the hereditary material.

Nucleus in Prokaryotic cells:

The prokaryotic cells do not contain a prominent nucleus. Their chromosome is made of DNA only and floats in cytoplasm.



Structure of Nucleus and chromosome

Q.7: Write a note on cytoskeleton.

Ans. Cytoskeleton:

It ts a network of thin tubes and filaments present throughout the cytoplasm. It consists of three parts i.e. microtubules, microfilaments, and intermediate filaments.

Microtubules:

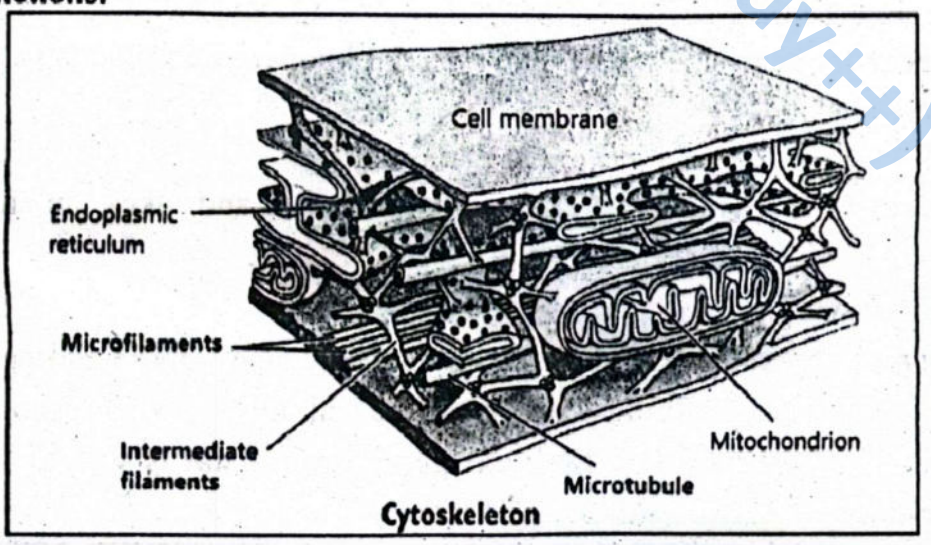
Microtubules are hollow tubes made up tubulin protein. This part holds organelles in place, maintains a cell's shape, and act as tracks for organelles. Microtubules also make mitotic spindle, cilia and flagella.

Microfilaments:

Microfilaments are finer than microtubules. These are made up of contractile proteins, mainly actin. They help in cell movement e.g., the crawling of white blood cells and the contraction of muscle cells.

Intermediate filaments:

Intermediate filaments are rods made of variety of proteins, mainly keratin and vimentiln. They anchor the nucleus and some other organelles in the cell. They also make cell-to-cell junctions.



Cytoskeleton

Q.8: Write a short note on ribosome.

Ans. Ribosome:

Ribosomes are tiny granular structures.

Location:

Ribosomes float freely in the cytoplasm and are also attached on the surface of rough endoplasmic reticulum.

Composition:

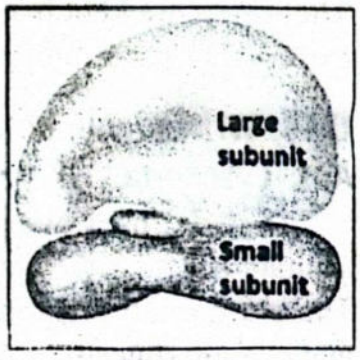
They are composed of almost equal amounts of proteins and ribosomal RNA (rRNA).

Prokaryotic Ribosomes:

Ribosomes are not bounded by membranes and so are also found in prokaryotes.

Eukaryotic Ribosomes:

Eukaryotic ribosomes are slightly larger than prokaryotic ones.



Ribosome

Function:

Each ribosome consists of two subunits. Ribosomes are the sites of protein synthesis. The two subunits of a ribosome unite during the process of protein synthesis. When a ribosome has finished its work, its subunits get separated again.

Q.9: What do you know about endoplasmic reticulum? Write its types and functions.

Ans. Endoplasmic Reticulum:

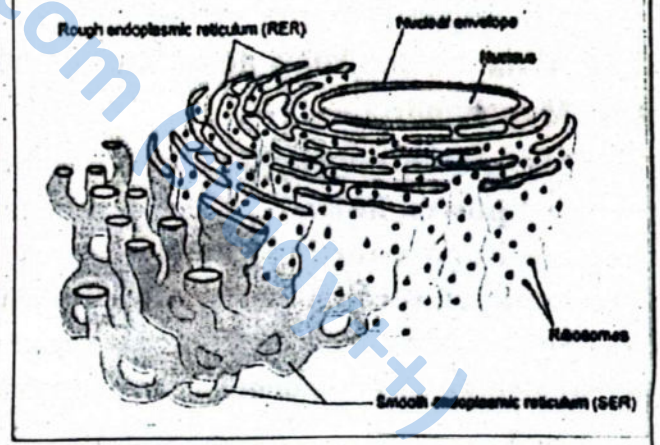
It is a network of membrane-bounded channels present throughout the cytoplasm of eukaryotic cell. There are two types of endoplasmic reticulum.

Rough Endoplasmic Reticulum (RER):

Numerous ribosomes are attached on its surface. RER serves the function in protein synthesis.

Smooth Endoplasmic Reticulum (SER):

It lacks ribosomes. It is involved in lipid metabolism and in the transport of materials from one part of the cell to the Other. It also detoxifies the harmful chemicals that have entered the cell. In muscle cells, the SER is also involved in contraction process.



Smooth and Rough Endoplasmic Reticulum

Q.10: Describe the formation and function of the Golgi complex apparatus.

Ans. Golgi Apparatus

Discovery:

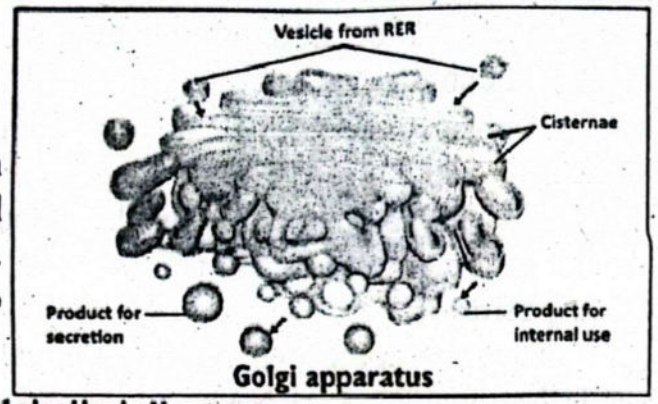
In 1898, an Italian physician Camillo Golgi discovered a set,of flattened sacs in the cytoplasm. These flattened sacs, called cisternae, are stacked over each other and make a structure known as Golgi apparatus.

Location:

It is found in both plant and animal cells.

Function:

It modifies molecules coming from rough ER and packs them into small membrane-bound sacs called Golgi vesicles. These sacs are kept in cell or are transported to exterior in the form of secretions.



Golgi apparatus

Q.11: Write a note on lysosomes, also draw labelled diagram.

Ans. Lysosomes

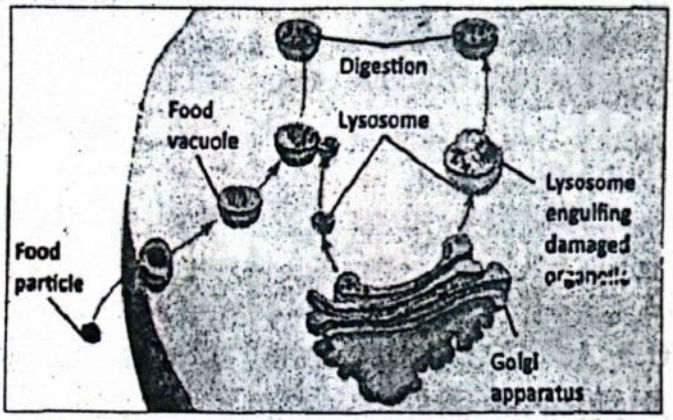
Lysosomes were discovered by Belgian scientist. Christian Rene de Duve. These are small membrane-bound vesicles that contain digestive enzymes.

Location:

Lysosomes are predominantly found in animal cells.

Function:

1. Lysosome fuses with food vacuole and its digestive enzymes break down the food present in vacuole.
2. They also engulf the damaged organelles and break them.
3. Lysosomes also store certain molecules for later use.

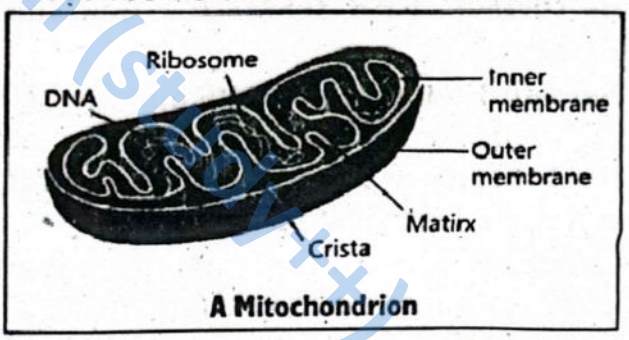


Formation and function of Lysosome

Q.12: What do you know about mitochondria? Describe its structure and function.

Ans. Mitochondria

Mitochondria (singular: mitochondrion) are the **"power house"** of the cell because they produce energy. They perform the reactions, of aerobic respiration in which oxygen is used to break food (glucose) to release energy (ATP - adenosine triphosphate).



A Mitochondrion

Structure:

Mitochondria are double membrane-bounded organelles present only in eukaryotes.

Outer membrane:

The outer membrane of mitochondria is smooth.

Inner membrane:

Inner membrane forms many folds. These folds are called cristae. (singular crista).

Function of Cristae:

They increase the surface area for respiration.

Matrix:

The inner fluid-like material is called matrix.

Presence of DNA and Ribosomes:

Mitochondria contain their own DNA and ribosomes. The ribosomes of mitochondria are more similar to prokaryotic ribosomes than to eukaryotic ribosomes.

Q.13: What are plastids? Discuss the types of plastids.

Ans. Plastids

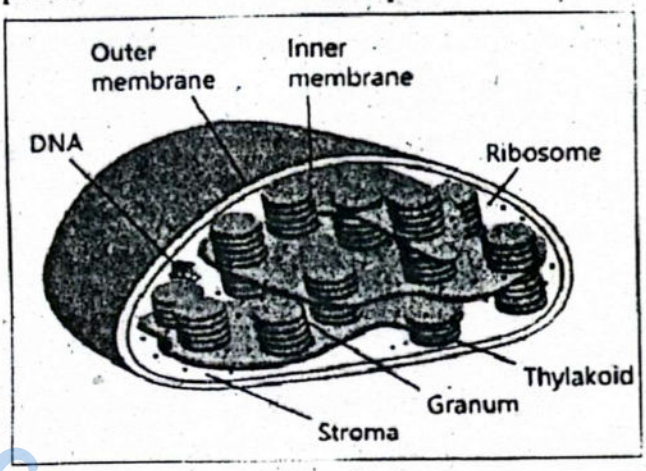
Plastids are membrane bound organelles that are present only in the cells of plants and photosynthetic protists (algae).

Types of Plastids:

There are three main types of plastids:

- Chloroplasts
- Chromoplasts
- Leucoplasts

Chloroplasts:



Chloroplast

Chloroplasts are green plastids present in the cells of green parts of plants and in algae. They contain photosynthetic pigments e.g., the green pigment chlorophyll.

Chloroplast is enclosed within two membranes. On the internal side of inner membrane, there are many sets of stacked membranes. These stacks are called grana (singular, granum) while the sac-like structures which make a granum are called **thylakoids.** Photosynthetic pigments are present on the surface of thylakoids. A fluid called stroma surrounds the thylakoids. Like mitochondria, thloroplasts also contain DNA and ribosomes.

Function:

They carry out photosynthesis. With the help of their photosynthetic pigments, they capture light energy and convert it into chemical energy in the form of glucose.

Chromoplasts:

Chromoplasts are the plastids that contain pigments such as carotenoids.

Location:

Carotenoids are associated with bright colours and are present in the cells of flower petals and fruits.

Function:

Chromoplasts give colours to these parts, thus helping in pollination and dispersal of fruit and seeds.

Leucoplasts:

Leucoplasts are plastids that have no pigments. They are involved in the storage of starches, lipids, and proteins.

Location:

They are present in the cells of those parts where food is stored e.g., underground stems, seeds, roots etc.

Q.14: Explain the vacuoles.

Ans. Vacuoles:

These are single membrane-bound sacs filled with fluid.

Vacuole in Animal cells:

Animal cell may have many small temporary vacuoles. They contain water and food substances.

Contractile Vacuoles:

Some fresh water organisms like amoeba and sponges have contractile vacuoles which collect and pump out extra water and other wastes. Some cells ingest food by forming food vacuoles. Food vacuoles also store food.

Vacuole in Plant cells:

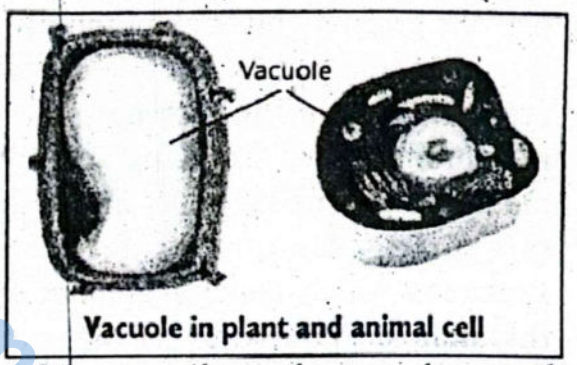
Most mature plant cells have a single, large, central vacuole. It is formed by the fusion of many small vacuoles.

Tonoplast:

The membrane of plant vacuole is called tonoplast.

Cell sap:

The sap inside plant vacuole is called cell sap. It is a watery solution of salts.



Vacuole in plant and animal cell

Turgor pressure:

Due to this large central vacuole, the cytoplasm is pushed to a side. This outward pressure of the vacuole on the cytoplasm and cell wall makes plant cells turgid. This pressure is called turgor pressure and the process is called turgor.

Q.15: Explain the Centrioles.

Ans. Centrioles:

Centrioles are barrel-shaped organelles.

Plant cells:

Centrioles are absent in prokaryotes, higher plants and fungi.

Animal cells:

Centrioles are found in the cells of animals and most protists.

Centrosomes:

There is a pair of centrioles in which both centrioles are at right angles to each other. In animal cells, the pair is called a centrosome and it is located near the nuclear envelope.

Structure of Centrioles:

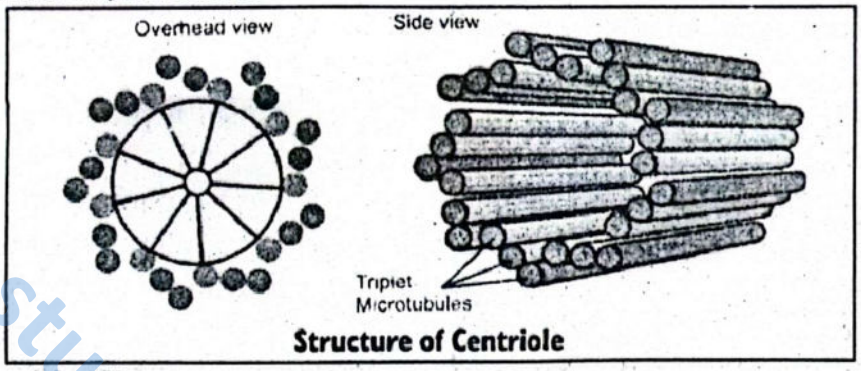
Each centriole is formed of 9 triplets of microtubule (made up of tubulin protein).

Spindle fibres:

At the start of cell division, the pair of centrioles duplicates. The new pairs move to the opposite pole of the cell. There, they form spindle fibres.

Basal bodies:

The cells which have cilia or flagella contain centriole near cell membranes. These centrioles are called basal bodies.



Structure of Centriole

Function of Basal bodies:

Basal bodies are responsible for the formation of cilia and flagella.

Q.16: Give a comparison between plant and danimal cells.

Ans. Brief Comparison between Plant and Animal Cells

Component	Description	Where found	Function
Animal and Plant cells			
Cytoplasm	Jelly-like, with organelles in it	Between plasma membrane and nuclear envelope	Provides the site to cell organelles, site of metabolic reactions
Cell membrane	A partially permeable membrane that forms a boundary around the cytoplasm	Around cytoplasm	Prevents cell contents; controls what substances enter and leave the cell
Nucleus	A spherical or oval organelle containing DNA	In the centre in animal cells, on a side in plant cells	Controls cell division; controls cell activities
Plant Cells only			
Cell wall	A tough, non-living outer layer made of cellulose	Around the outside of plant cells	Prevents mechanical support; allows water and salts to pass
Large Vacuole	A fluid-filled space surrounded by a membrane	Inside the cytoplasm of plant cells	Contains salts and water; helps to keep plant cells turgid
Chloroplast	An organelle containing, chlorophyll	Inside the cytoplasm of some plant cells	Traps light energy for photosynthesis

3.3 Structural Advantages of Plant and Animal cells

3.4 Cell Specialization

Q.17: Discuss structural advantages of plant and animals cells.

Ans. Structural Advantages of Plant and Animal Cells:

Plant and animal cells have distinct structural differences that reflect their specialized functions and adaptations.

Advantages of Plant Cel Structures:

- Plant cells have a rigid cell wall made of cellulose. It provides structural support and protection.
- They contain chloroplasts, which are responsible for photosynthesis. Chloroplasts convert light energy into chemical energy, allowing plants to produce food.
- The large central vacuole stores water, nutrients, and waste products. It provides turgor pressure that maintains cell shape.
- Plant cells are interconnected by plasmodesmata, channels that allow direct communication and transport of substances between cells.

Advantages of Animal Cell Structures:

- Animal cells have centrioles which make spindle fibres. This ensures the accurate distribution of chromosomes during cell division.
- They contain lysosomes, filled with enzymes that break down waste materials. Lysosomes contribute to cellular cleanup and recycling.
- Some animal cells have structures called flagella and cilia, which are involved in movement. For example, sperm cells have a flagellum that propels them toward the egg for fertilization.

Q.18: Describe some specialized cells of plants.

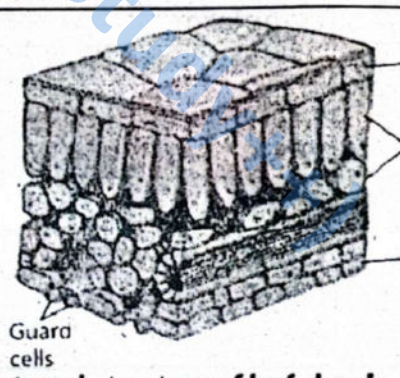
Ans. Cells of Plants:

Following are some specialized cells of plants.

1. Mesophyll cells
2. Epidermal cells

1. Mesophyll cells

These are green cells present in leaves. They are Specialized for photosynthesis. They contain large number of chloroplasts, which contain the green pigment chlorophyll necessary for capturing light energy. Their shape and arrangement in leaves is suitable for maximum absorption of light.

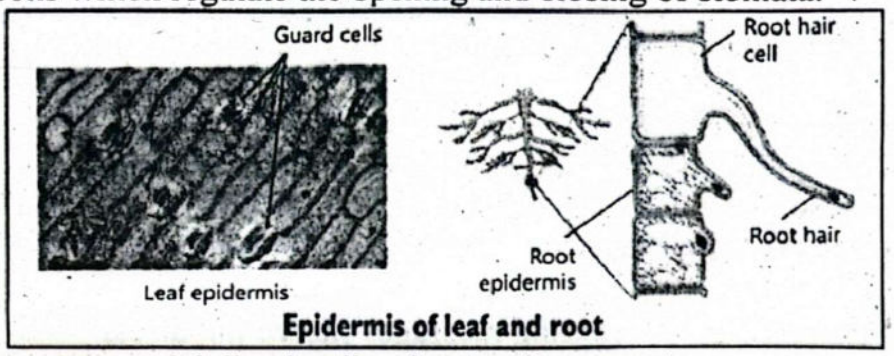


Internal structure of leaf showing mesophyll cells

2. Epidermal Cells:

They are flat and tightly packed cells that make the outer layer (epidermis) of plant organs. Epidermis protects the internal tissues. Modified cells of epidermis also perform other functions. For example, epidermis of root contains root hair cells. These cells make extensions called root hairs Root hairs increase surface area to absorb water and minerals from soil. The lower epidermis of leaves

contain guard cells which regulate the opening and closing of stomata.



Epidermis of leaf and root

Q.19: Describe some specialized cells of animals.

Ans. Specialized cells of animals:

Following are the specialized cells of animals:

1. Muscle cells **2.** Neurons **3.** Red Blood Cell **4.** Liver Cell

1. Muscle Cells: Muscle cells are specialized animal cells that can contract.

Shape and composition:

They are elongated cells filled with actin and other contractile proteins.

Types: There are three types fo muscle cells:

(i) Skeletal cells **(ii)** Cardic cells **(iii)** Smooth cells

(i) Skeletal Muscle:

Structure: They are long, striated.

Location: They are attached to bones.

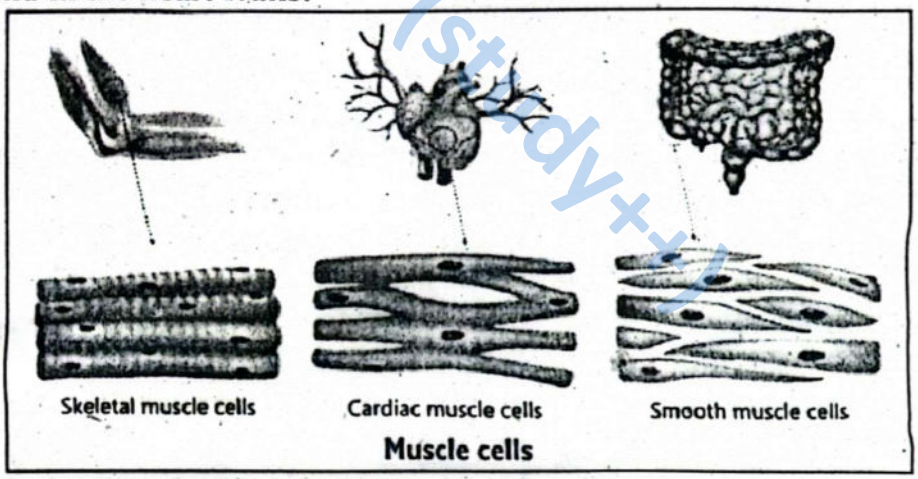
Function: They are voluntary in action and their contractions move the skeleton for body movements and locomotion.

(ii) Cardiac Muscle:

Structure: They are branched and striated

Location: They are found in the heart walls.

Function: They are involuntary in action and their contractions result in the pumping action of heart.



Muscle cells

(iii) Smooth Muscle:

Structure: They are spindle shaped and non-striated.

Location: They are found in the heart walls of many internal organs.

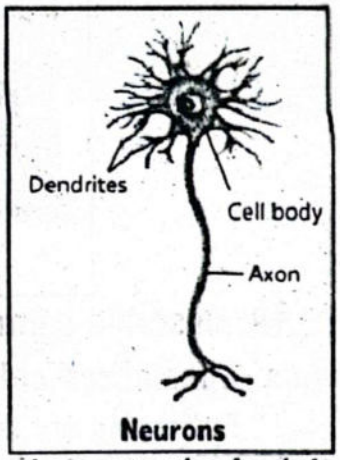
Function: They are involuntary in action. For example, smooth muscles in the alimentary canal contract to move food forward, while those in blood vessels regulate blood flow.

2. Neurons:

These are the specialized cells of the nervous system.

Structure:

A neuron consists of a cell body and two types of cytoplasmic extensions. Dendrites, the shorter extensions, receive nerve impulses and transmit them to the cell body. Axons, the longer extensions, carry nerve impulses away from the cell body.



Neurons

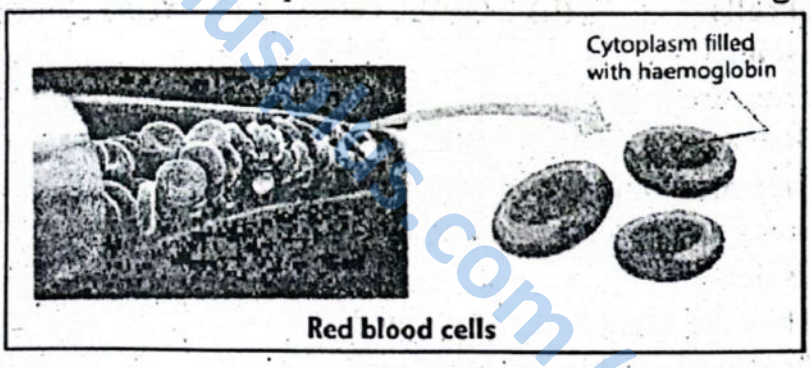
Function:

They responsible for transmitting messages (nerve impulses) throughout the body. To perform this function, they have a unique structure.

3. Red Blood Cell (Erythrocyte):

These blood cells are specialized to carry oxygen from the lungs to the body's tissues.

Structure: They are biconcave disk-shaped cells. This shape provides more surface area to absorb and release oxygen. They are filled with haemoglobin that actually carries oxygen. In mammals, the mature red blood cells do not contain nucleus, mitochondria, and endoplasmic reticulum etc. It helps to accommodate more haemoglobin.

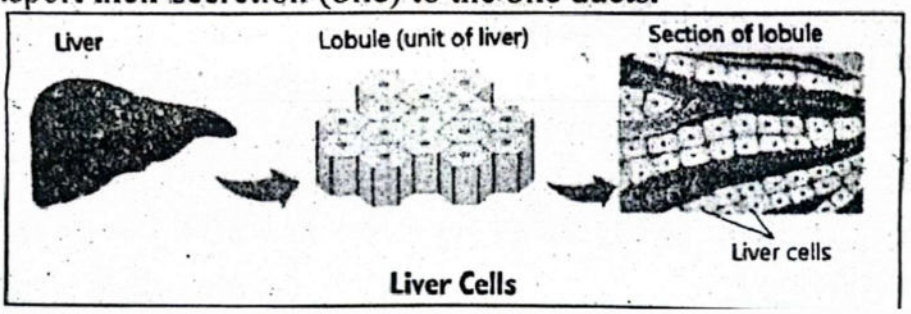


Red blood cells

4. Liver Cell:

Function: They are specialized for a lot of important functions like storage of glycogen, iron and some vitamins; detoxification of toxic substances; production of clotting proteins of blood, recycling of old red blood cells etc.

Structure: They have prominent nuclei for maximum activities required for making enzymes and other proteins. Large number of mitochondria provide the necessary ATP for energy-intensive processes. Expansive network of SER helps for extensive detoxification and lipid synthesis. There are large number of peroxisomes which contain enzymes to neutralize toxic substances. Small ducts are present between liver cells which collect and transport their secretion (bile) to the bile ducts.



Liver Cells

Q.20: Describe the concept of division of labour and how it applies in multicellular organisms. Give at least three examples.

Ans. Division of Labour within and across Cells

Division of labour refers to the specialization of different parts of a system to perform specific tasks more efficiently. It is a fundamental principle that enhances efficiency and functionality in biological systems (both within and across cells).

Within Cells:

Within a cell, this concept is exemplified by the various organelles that each carry out distinct functions necessary for the cell's survival. For instance, mitochondria generate energy, endoplasmic reticulum synthesizes proteins and lipids, and lysosomes break down waste materials. In this way, the function of, each organelle contributes to the cell's overall survival, growth, and functioning.

Across Cells:

In multicellular organisms, the division of labour extends across cells. Each type of cell performs a specific role and contributes to the overall functions of the organism. For example, muscle cells are specialized for contraction and movement, nerve cells for transmitting messages, and red blood cells for carrying oxygen. This intercellular specialization allows complex organisms to perform a wide range of functions.

3.5 Stem Cells

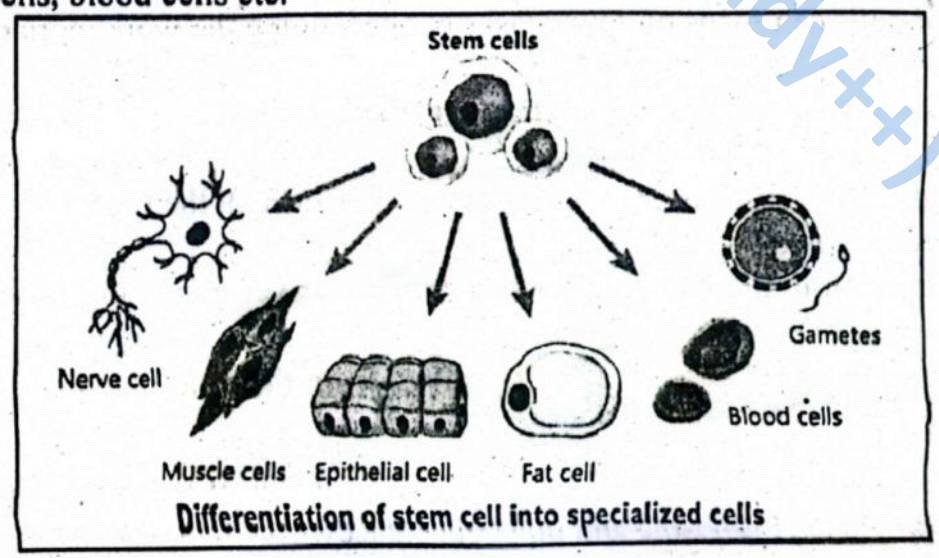
Q.21: Write a note on Stem cell.

Ans. Stem Cells

Unspecialized cell that has the ability to differentiate into a variety of specialized cell types is called stem cell.

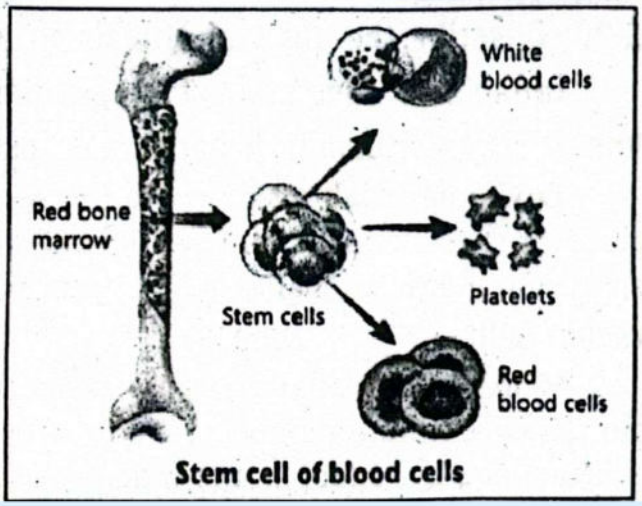
Explanation:

During development, when the earliest stem cell (zygote) divides, it makes different cell lines. The cells of each line differentiate into specific type like skin cells, muscle cells, nerve cells, blood cells etc.



Differentiation of stem cell into specialized cells

Stem cells also remain in different parts of the body throughout life. These stem cells can divide and differentiate into specific cells as the body needs Them. They can also regenerate damaged tissue under the right conditions. For example, stem cells present in skin help in wound healing. Stem cells present in liver also help it to repair after damage. Stem cells present in the bone marrow differentiate to make different types of blood cells and immune cells.



Stem cell of blood cells

Conceptual Long Questions

1. What is the important organelle of the cell?

Ans. The nucleus is the most important organelle of the cell because of the following reasons:

- Nucleus controls the genetic information of the cell and thus the genetic characteristics of an organism.
- It controls protein and enzyme synthesis.
- It controls cell division and cell growth.
- It is storage of DNA, RNA and ribosomes.
- It produces ribosomes.
- It regulates mRNA for protein transcription.

2. Discuss some advantages of cell specialization.

Ans. Advantages of cell Specialization:

Following are some advantages of cell specialization.

- **Division of labor:**
  Specialized cells perform specific functions avoiding duplication of work.
- **Efficiency:**
  Specialized cells can focus on fewer tasks at once, doing the work more efficiently.
- **Energy savings:**
  Specialized cells are always prepared, so they save energy.
- **Faster evolution:**
  Specialized cells evolve faster in the tasks they perform all the time.
- **DNA Protection:**
  Cell specialization allows organisms to express fewer genes in individual cells, which protects DNA from mutagens.

3. What would happen if cytoplasm is removed from the cell?

Ans. Cytoplasm:

It is the jelly like substance that fills the inside of a cell. It is a complex mixture of water, proteins, enzymes, salts and other substances.

Functions of cytoplasm:

Cytoplasm provides a medium for arganelles to move and function. It also helps in the transport of materials throughout the cell. It acts as the site for various metabolic reactions e.g; Glycolysis (break down of glucose). It also stores food and wastes of the cell.

Removal of Cytoplasm:

If cytoplasm is removed from the cell, it will eventually die. The cell will shrink and die as all the important metabolic processes will not take place in absence of cytoplasm.

4. What would happen if plastids are absent?

Ans. Plastids:

Plastids are present in the cells of plants photosynthetic protists (algae). There are three main types of plastids; chloroplasts, chromoplasts and leucoplasts.

Chloroplasts: Contain green pigment called chlorophyll and are responsible for the photosynthesis.

Chromoplasts: Contain pigments such as casotenoids. They give colours to petals and fruits.

Leucoplasts have no pigments. They are involved in the storage of starches, lipids and proteins.

Absence of Plastids:

If there are no plastids in the cells them the plant cells would not be able to perform the important function like photosynthesis starch and food storage etc. The oxygen would also not be released by the plants and thus, the living organisms would die without oxygen and food for which thes depends on plant.

5. Differentiate between prokaryotic and eukaryotic cells.

Ans.

Organelles	Prokaryotic cell	Eukaryotic cell
Ribosomes	Smaller	Larger
Endoplasmic reticulum	Absent	Present
Cell wall	Composed of Peptidoglycan	Made of cellulose (in plants), chitin (in fungi), abrent in animal cells
Centrioles	Absent	Present
Golgi Complex	Present	Present
Lysosomes	Absent	Present in animals Absent in plants.
Nucleus	Not very prominent	Prominent
Chromosomes	Consist of DNA only	Consist of DNA and protein
DNA	Simpler	Complere and extensive

Information

Cell is like a City: A cell is like a busy city. For example, jn a cell there are structures that produce energy (tike power plants of the city), some structures process and transport materials (like roads and delivery services), and other structure remove or break wastes (like waste disposal units). Finally, just like a city has a government, a cell has a nucleus that directs its activities, by giving instructions for every function of the cell.

Some cells are large enough to be seen with naked eye e.g., the egg cell of ostrich, a unicellular green aigae Acetabularia, and a unicellular giant Amoeba.

There are two basic types of cells: prokaryotic and eukaryotic. Eukaryotic cells are more complex than the prokaryotic cells.

Plasmodesmata (singular plasmodesma) are the channels in cell walls that allow the exchange of molecules between adjacent cells.

Another lipid, cholesterol, is attached with the inner sides of the lipid bilayer. Cholesterol is absent in the membranes of most bacteria.

The liquid part of the cytoplasm that includes molecules and small particles, such as ribosomes, but not membrane-bound organelles is called cytosol.

The nucleus serves as the cell's "control center". It oversees cellular activities by directing the production of proteins.

Point to ponder!

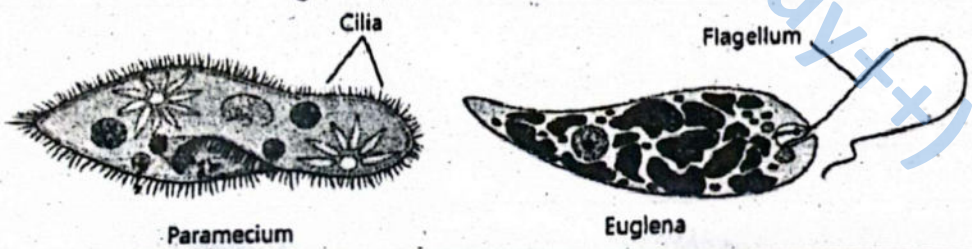
Q. Why are the vacuoles called the wastebins of the cells?

Ans. Vacuoles are called the wastebins of the cells because they collect and pump out wastes from the body.

Toxic ammonia is converted into less toxic form urea in liver; hence it assists kidney function.

Cilia and Flagella:

Some cells have.thin, tail-like projections called cilia (singular cilium) and flagella (singular flagellum). Cilia are short in length and are usually numerous in number, while flagella are longer but less in number. Eukaryotic cilia and flagella consist of nine pairs of microtubules which surround a single central pair of microtubules. Cilia and flagella are connected to the basal body. Prokaryotic cells also have flagella but their structure is completely different. Prokaryotic flagella are made of a protein called flagellin. The function of cilia and flagella is movement.



In some parts of the body, such as the gut and bone marrow, adult stem cells regularly divide to produce new tissues - for maintenance and repair.

Key Points

- The cell is the fundamental building block of life.
- The primary wall of the cell wall is made up of cellulose and hemicellulose.

- The secondary cell wall is made of lignin.
- The cell membrane is made of a lipid bilayer with embedded proteins.
- Cytoskeleton is a network of microfilaments, microtubules and intermediate filaments.
- Ribosomes are made of ribosomal RNA (rRNA) and proteins.
- The Golgi apparatus is a set of many flattened sacs (cisternae) stacked over each other.
- Lysosomes have strong digestive enzymes which are responsible for breaking down various biomolecules into simpler compounds that can be used by the cell.
- Mitochondria are the "power houses" of the cell because they produce energy by cellular respiration.
- Chloroplasts are responsible for photosynthesis.
- Centriole is formed of 9 groups of microtubule triplets (made up of tubulin protein).
- Nucleus is spherical or oval in shape and is surrounded by a double membrane called the nuclear envelope.
- Chromosomes are composed of Deoxyribonucleic acid (DNA) and proteins.
- Mesophyll cells are found in the leaves of plants and are responsible for photosynthesis.
- Epidermal Cells make up the outermost layer of plant tissues, forming a protective barrier against the environment.
- Neurons are specialized cells of the nervous system that transmit nerve impulses throughout the body.
- Muscle cells are responsible for movement.
- Red blood cells are a type of blood cell that carries oxygen from the lungs to the body's tissues and transport carbon dioxide back to the lungs for exhalation.
- Stem cells are undifferentiated or unspecialized cells that can differentiate into specific cells.

Additional MCQs

3.1 + 3.2 Cell + Structure of Cell

1. It is the basic unit of life:

(a) Cell wall (b) Nucleus (c) Ribosome (d) Cell

2. The basic structure of a cell was discovered by:

(a) Louis Paster (b) Robert Brown

(c) Robert Hooke (d) Zacharias Janseen

3. **Robert Hooke discovered the basic structure of a cell in:**
(a) 1664 (b) 1665 (c) 1666 (d) 1667

4. **In 1831, Robert Brown discovered:**
(a) Mitochondrian (b) Cell wall (c) Nucleus (d) Cell membrane

5. **Middle lamella, primary wall and secondary wall are three layers of the:**
(a) Cell wall (b) Cell membrane (c) Cytoplasm (d) Cytoskeleton

6. **Just above the cell membrane there is present:**
(a) Primary wall (b) Middle lamella (c) Secondary wall (d) Lipid bilayer

7. **The cell wall is mainly composed of:**
(a) Cellulose (b) Hemicellulose (c) Pectin (d) All of these

8. **Which of the following layers of cell wall contains magnesium, Calcium and pectin?**
(a) Middle lamella (b) Secondary wall (c) Primary wall (d) Lipid bilayer

9. **Which layer of cell wall mainly composed of cellulose, lignin and other chemicals?**
(a) Secondary wall (b) Primary wall (c) Lipid bilayer (d) Middle lamella

10. **The cell wall of algae is composed of:**
(a) cellulose (b) Lignin (c) Pectin (d) Hemicellulose

11. **The cell wall of prokaryotes is made up of.**
(a) Pectin (b) Cellulose (c) Hemicellulose (d) Peptidoglycan

12. **The cell of fungi is made up of:**
(a) Pectin (b) Chitin (c) Hemicellulose (d) Cellulose

13. **Fluid mosaic is referred to the structure of :**
(a) Cell wall (b) Cell membrane (c) Cytoplasm (d) Chloroplast

14. **Cell membrane is composed of:**
(a) Pectin, Chitin and Cellulose (b) Proteins, Lipids and Carbohydrates
(c) Cellulose, Chitin and Calcium
(d) Magnesium, Calcium and Carbohydrates

15. **It is the jelly like substance that fills the inside of a cell.**
(a) Vacuole (b) Nucleus (c) Cytoplasm (d) Chloroplast

16. **It is a selectively permeable membrane.**
(a) Cell wall (b) Cytoplasm (c) Nucleus (d) Cell membrane

17. **Which organelle of cell serves as the cell's control center?**
(a) Cytoplasm (b) Nucleus (c) Ribosome (d) Vacuole

18. **It is bounded by a double membrane known as nuclear envelope.**
(a) Cytoplasm (b) Vacuole (c) Nucleus (d) Ribosome

19. **The inner jelly like material of nudes is called:**
(a) Nucleoplasm (b) Cytoplasm (c) Lysosome (d) Ribosome

20. **Which of the following contains chromatin?**
(a) Ribosome (b) Cytoplasm (c) Nucleus (d) Lysosome

21. **It is a network of thin tubes and filaments present throughout the cytoplasm.**
(a) Mitochondria (b) Ribosome (c) Cytoskeleton (d) Lysosome

22. **Microtubules are made up of protein:**
(a) Actin (b) Vimentin (c) Tubulin (d) Lignin

23. **Microfilaments are made up of contractile proteins mainly:**
(a) Actin (b) Tubulin (c) Lignin (d) Chitin

24. **Mitotic spindle, cilia and flagella are made at:**
(a) Microfilament (b) Middle Lamella
(c) Intermediate filament (d) Microtubules

25. **These are rods made of variety of proteins, mainly keratin and vimentin.**
(a) Intermediate filament (b) Microfilament
(c) Microtubules (d) Nuclear envelope

26. **These are hollow tubes made up of tubulin protein:**
(a) Intermediate filaments (b) Microfilaments
(c) Primary wall (d) Microtubules

27. **These rods make cell-to-cell junctions:**
(a) Microtubules (b) Intermediate filaments
(c) Microfilaments (d) Ribosomes

28. **Microtubules make:**
(a) Mitotic spindle (b) Cilia (c) Flagella (d) All of these

29. **Tiny granular structures are:**
(a) Chromosomes (b) Endoplasmic reticulum
(c) Ribosomes (d) Lysosomes

30. **These are ting granular structures.**
(a) Lysosomes (b) Ribosomes (c) Golgi apparatus (d) Mitochondria

31. **It is a network of membrane bounded channels present throughout the cytoplasm of eukaryotic cell.**
(a) Endoplasmic reticulum (b) Cytoskeleton
(c) Chromosomes (d) Golgi apparatus

32. **It is a network of thin tubes and filaments present throughout the cytoplasm**
(a) Golgi apparatus (b) Plastids
(c) Endoplasmic reticulum (d) Cytoskeleton

33. **In muscle cells, is also involved in contraction process:**
(a) Rough endoplasmic reticulum (b) Smooth endoplasmic reticulum
(c) Golgi apparatus (d) Lysosomes

34. **Which of the following is the function of Smooth endoplasmic reticulum?**
(a) It is involved in lipid metabolism
(b) It is involved in the transportation of materials
(c) It also detoxifies the harmful chemicals
(d) All of these

35. **Golgi was awarded Nobel Prize for physiology and medicine:**
(a) 1905 (b) 1906 (c) 1907 (d) 1908

36. **Belgian Scientist Christian Rene de Duve discovered:**
(a) Golgi apparatus (b) Lysosomes
(c) Endoplasmic reticulum (d) Mitochondria

37. **In 1898, Camillo Golgi discovered:**
(a) Ribosomes (b) Golgi apparatus (c) Mitochondria (d) Lysosomes

38. **Camillo Golgi discovered golgi apparatus in the cytoplasm in:**
(a) 1886 (b) 1887 (c) 1888 (d) 1898

39. **These are small membrane bound vesicles that contain digestive enzymes.**
(a) Mitochondria (b) Ribosomes (c) Lysosomes (d) Vacuole

40. **Which are called the powerhouse of the cell:**
(a) Lysosomes (b) Golgi apparatus (c) Mitochondria (d) Plastids

41. **There are double membrane bounded organelles present only in eukaryotes:**
(a) Lysosomes (b) Mitochondria (c) Golgi apparatus (d) Centrioles

42. **Cristae are found in:**
(a) Mitochondria (b) Golgi apparatus (c) Lysosomes (d) Cytoskeleton

43. **The inner fluid like material in the mitochondria is called**
(a) Cisternae (b) Matrix (c) Nucleoplasm (d) Thylakoids

44. **Which organelle contain their own DNA and ribosomes.**
(a) Cytoskeleton (b) Centrioles (c) Vacuoles (d) Mitochondria

45. **These are green plastids present in the cells of green parts of plants and in algae.**
(a) Chromoplasts (b) Cloroplasts (c) Leucoplasts (d) Centrioles

46. **They contain photosynthetic pigments called chlorophyll:**
(a) Leucoplasts (b) Chromoplasts (b) Chloroplasts (d) Thylakoids

47. **Grana is found in the:**
(a) Centrioles (b) Chromoplasts (c) Chloroplasts (d) Vacoules

48. **The sac like structures that make a granum are called:**
(a) Cisternae (b) Thylakoids (c) Cristae (d) Basal bodies

49. **It is a fluid that surrounds the thylakoids:**
(a) Grama (b) Matrix (c) Storma (d) Cisternae

50. **The type of plastids that contain carotenoids is:**
(a) Leucoplasts (b) Chromoplasts (c) Chloroplasts (d) All of these

51. **Chromoplasts give colours to:**
(a) Flowers (b) Petals (c) Fruits (d) All of there

52. **Leucoplasts are involved in the storage of:**
(a) Starch (b) Lipids (c) Proteins (d) All of these

53. **Leucoplasts are present in the cells of:**
(a) Underground stems (b) Seeds
(c) Roots (d) All of these

54. **It is the type of plastid having no pigment.**
(a) Chloroplasts (b) Leucoplasts (c) Chromoplasts (d) All of these

55. **The membrane of plant vacuole is called:**
(a) Nucleoplasm (b) Middle lamella (c) Tonoplast (d) Matrix

56. **The sap inside plant vacuole is called:**
(a) Matrix (b) Cell sap (C) Cisternae (d) Nucleoplasm

57. **These are barrel shaped organelles found in the cells of animals and most protists.**
(a) Vacuoles (b) Centrioles (c) Thylakoids (d) Ribosomes

58. **Centrioles are absent in:**
(a) Prokaryotes (b) Higher plants (c) Fungi (d) All of these

59. **In animal cells, the pair of centrioles is present near the:**
(a) Nuclear membrane (b) Cell membrane
(c) Cell wall (d) Mitochondria

60. **Each centriole is formed of _____ triplets of microtubule.**
(a) 3 (b) 6 (c) 9 (d) 12

61. **They are responsible for the formation of Cilia and flagella.**
(a) Thylakoids (b) Cristae (c) Cisternae (d) Basal bodies.

62. **Eukaryotic cilia and flagella consist of nine pairs of:**
(a) Microfilaments (b) Microtubules
(c) basal bodies (d) Intermediate filaments

63. **Cilia and flagella are connected to the:**
(a) Basal body (b) Centrosome (c) Golgi Vesicles (d) Plasmodesmata

64. **Prokaryotic flagella are made of a protein called:**
(a) Tubulin (b) Actin (c) Keratin (d) Flagellin

65. **It is present between plasma membrane and nuclear envelope:**
(a) Cell membrane (b) Cell wall (c) Cytoplasm (d) Chloroplast

66. **Name the organelle present in the centre in animal cells and on a side in plant cells.**
(a) Chloroplast (b) Nucleus (c) Cell wall (d) Cell membrane

67. **It is present around cytoplasm:**
(a) Cell membrane (b) Cell wall (c) Nucleus (d)Nuclear envelope

68. **It is present around the outside of plant cells.**
(a) Cell membrane (b) Cell wall (c) Nuclear envelope (d) Primary wall

69. **A tough, non living outer layer made of cellulose is:**
(a) Nuclear envelope (b) Cell wall (c) Cell membrane (d) secondary wall

70. **It is an organelle containing chlorophyll:**
(a) Nucleus (b) Lysosome (c) Vacuole (d) Chloroplast

71. **It is a partially permeable membrane that forms a boundary around the cytoplasm.**
(a) Nuclear envelope (b) Middle lamella
(c) Cell memberane (d) Cell wall

72. **Which helps to keep plant cells turgid.**
(a) Chloroplast (b) Nucleus (c) Vacuole (d) Cytoplasm

73. **It traps light energy for photosynthesis.**
(a) Chloroplast (b) Vacuole (c) Nucleus (d) Lysosome

74. **_____ are called the wastebins of the cells:**
(a) Lysosomes (b) Centrioles (c) Vacuoles (d) Plastids

75. **Plant cells are interconnected by:**
(a) Golgi apparatus (b) Plasmodesmata (c) Microtubles (d) Centrosome

76. **Green cells present in leaves are called:**
(a) Epidermal cells (b) Mesophyll cells (c) Guard cells (d) Stomata

77. **The cells of ____ contains guard cells which regulate opening and closing of stomata.**
(a) Upper epidermis (b) Mesophyll
(c) Lower epidermis (d) None of these

78. **These cells are long and striated.**
(a) Cardiac muscle cells (b) Smooth muscle cells
(c) Skeletal muscle cells (d) a and b both

79. **Which type of muscle cells are attached to bones.**
(a) Skeletal muscle cell (b) Cardiac muscle cell
(c) Muscle cells (d) Smooth muscle celt

80. **Cardiac muscle cells are:**
(a) long and striated (b) branched and non striated
(c) branched and striated (d) Spindle shaped

81. **_____ have spindle shaped and non striated muscle cells:**
(a) Skeletal muscle cells (b) Cardiac muscle cells
(c) Smooth muscle cells (d) a and b both

82. **Their contraction move the skeleton for body movements and locomotion.**
(a) Cardiac muscle cells (b) Skeletal muscle cells
(c) Smooth muscle cells (d) All of these

83. **Cardiac muscle cells are found in the:**
(a) Heart walls (b) Bones (c) Alimentary canal (d) Internal organs

84. **Neurons are the specialized cells of the:**
(a) Digestive system (b) Nervous system
(c) Respiratory system (d) Circulatory system

85. **A neuron consists of:**
(a) Cell body (b) Axon (c) Dendrites (d) All of these

86. **_____ receive nerve impulses and transmit them to the cell body.**
(a) Axons (b) Dendrites
(c) Cardiac muscle cells (d) Skeletal muscle cell

87. **They carry nerve impulses away from the cell body.**
(a) Red blood cells (b) White blood cells
(c) Dendrites (d) Axons

88. **Which blood cells are specialized to carry oxygen from the lungs to the body's tissues?**
(a) White blood cells (b) Red blood cells
(c) Liver cells (d) Muscle cells

89. **In mammals, the mature red blood cells do not contain:**
(a) Nucleus (b) Mitochondria
(c) Endoplasmic reticulum (d) All of these

90. **Red blood cells are filled with:**
(a) Chlorophyll (b) Carotenoid (c) Haemoglobin (d) Matrix

91. **Haemoglobin carries:**
(a) Carbon dioxide (b) Oxygen (c) Nitrogen (d) Ammonia

92. **Red Blood cells are also called:**
(a) Hepatocytes (b) Thylakoids (c) Grana (d) Erythrocyte

93. **Liver cells are also called:**
(a) Erythrocyte (b) Plasmodesmata (c) Hepatocytes (d) Powerhouse

94. **Toxic ammonia is converted into less toxic form urea in:**
(a) Kidney (b) Stomach (c) Liver (d) Small intestine

95. **Which organelle generates energy?**
(a) Endoplasmic reticulum (b) Lysosome
(c) Mitochondria (d) Vacuole

96. **Breakdown of waste material is done in:**
(a) Golgi apparatus (b) Endoplasmic reticulum
(c) Ribosome (d) Mitochondria

97. **It synthesizes proteins and lipids.**
(a) Endoplasmic reticulum (b) Lysosome
(c) Vacuole (d) Mitochondria

98. **These cells are specialized for contraction and movement of muscles.**
(a) Neurons (b) Liver cells (c) Muscle cells (d) Red blood cells

99. **Which of the following cells are specialized for transmitting messages.**
(a) Liver cells (b) Muscle cells (c) Red blood cells (d) Neurons

100. **_____ are specialized for carrying oxygen.**
(a) Red blood cells (b) Liver cells (c) Neurons (d) Muscle cells

101. **When it divides, it makes different cell lines:**
(a) Liver Cell (b) Neuron (c) Stem cell (d) Red blood cell

102. **Stem cells present in _____ help in wound healing.**
(a) Liver (b) Skin (c) Bone marrow (d) Stomach

103. **Stem cells present in the _____ differentiate to make different types of blood cells and immune cells.**
(a) Liver (b) Skin (c) Bone marrow (d) Gut

104. **Stem cells of bone marrow and _____ produce new tissue for maintenance and repair.**
(a) Liver (b) Gut (c) Stomach (d) Kidney

ANSWERS:

1.	(d)	2.	(c)	3.	(b)	4.	(c)	5.	(a)	6.	(a)	7.	(d)
8.	(a)	9.	(a)	10.	(a)	11.	(d)	12.	(b)	13.	(b)	14.	(b)
15.	(c)	16.	(d)	17.	(b)	18.	(c)	19.	(a)	20.	(c)	21.	(c)
22.	(c)	23.	(a)	24.	(d)	25.	(a)	26.	(d)	27.	(b)	28.	(c)
29.	(b)	30.	(a)	31.	(d)	32.	(b)	33.	(d)	34.	(b)	35.	(b)
36.	(d)	37.	(b)	38.	(b)	39.	(b)	40.	(d)	41.	(c)	42.	(b)
43.	(a)	44.	(b)	45.	(d)	46.	(b)	47.	(b)	48.	(c)	49.	(b)
50.	(c)	51.	(b)	52.	(d)	53.	(d)	54.	(d)	55.	(d)	56.	(c)
57.	(b)	58.	(d)	59.	(a)	60.	(c)	61.	(d)	62.	(b)	63.	(a)
64.	(d)	65.	(c)	66.	(b)	67.	(a)	68.	(b)	69.	(b)	70.	(d)
71.	(c)	72.	(c)	73.	(a)	74.	(c)	75.	(b)	76.	(b)	77.	(c)
78.	(c)	79.	(a)	80.	(c)	81.	(c)	82.	(b)	83.	(a)	84.	(b)
85.	(d)	86.	(b)	87.	(d)	88.	(b)	89.	(d)	90.	(c)	91.	(b)
92.	(d)	93.	(c)	94.	(c)	95.	(c)	96.	(b)	97.	(a)	98.	(c)
99.	(d)	100.	(a)	101.	(c)	102.	(b)	103.	(c)	104.	(b)		

Conceptual MCQs

1. **Which of the following cellular organelles have their own DNA?**
   (a) Chloroplast (b) Mitochondria (c) Nucleus (d) Ribosomes
2. **The major component of the plant cell Wall is:**
   (a) Cellulose (b) Chitin (c) Peptidoglycan (d) Matrix
3. **The cell wall of prokaryotes is composed of:**
   (a) Chitin (b) Cellulose (c) Peptidoglycan (d) Lignin
4. **Fluid of chloroplast is celled:**
   (a) Matrix (b) Cytosol (c) Thylakoid (d) Stroma
5. **Fluid mosaic model explains the structure of:**
   (a) Cell membrane (b) Cell wall (c) Nucleus (d) Ribosome

ANSWERS:

1. (b) 2. (a) 3. (c) 4. (d) 5. (a)

Additional Short Questions

3.1 + 3.2 Cell + Structure of Cell

1. **Which tiny building blocks make up all living things?**

Ans. Cells make up all living things.

2. What is cell?

Ans. Cell is the basic unit of life. Every living thing from the smallest bacterium to the largest whale, is made of cells.

3. Give examples of some cells that can be seen with naked eye.

Ans. An egg cell of ostrich, a unicellular green algae Acetabularia and a unicellular giant Amoeba are some cells that can be seen with naked eye.

4. How many basic types of cells are there? Name them.

Ans. There are two basic types of cells, i.e; Prokaryotic and eukaryotic. Eukaryotic cells are more complex than the prokaryotic cells.

5. Who discovered the basic structure of a cell?

Ans. Robert Hooke discovered the basic structure of a cell.

6. Who discovered nucleus in the cell?

Ans. In 1831, Robert Brown discovered nucleus in the cell.

7. What is cell wall?

Ans. Cell wall is a rigid non-living wall around the cell membrane in the cells of bacteria, fungi, plants and some protists.

8. What is the function of cell wall?

Ans. The cell wall provides shape, strength, protection and support to the inner living matter (protoplasm) of the cell.

9. What are the main layers of the plant cell wall?

Ans. The plant cell wall is made up of three layers i.e; middle lamella, primary wall and secondary wall.

10. Differentiate between the primary wall and secondary wall of the plant.

Ans. Primary wall:

It is present just above the cell membrane. It is mainly composed of cellulose, hemicellulose, and pectin.

Secondary wall:

It is present on the inner side of primary wall. It is mainly made of cellulose, lignin and other chemicals.

11. What is middle lamella?

Ans. Middle lamella:

It is the layer of the plant cell wall that holds together the primary walls of adjacent cells. It contains magnesium, calcium and pectin.

12. Which plant cells make the secondary wall on the inner side of primary wall?

Ans. Some plant cells e.g; xylem cells make the secondary wall on the inner side of primary wall.

13. What is the primary component of the cell wall in algae?

Ans. The cell wall of algae is composed of cellulose.

14. What cell wall of prokaryotesis is composed of ?

Ans. The cell wall of prokaryotes is made of peptidoglycan (a single molecule made of amino acids and sugars).

15. From which component the cell wall of fungi is made of ?

Ans. The cell wall of fungi is made of chitin.

16. What is cell membrane?

Ans. Cell membrane is a thin and elastic cell membrane around the cytoplarm.

17. Why cell membrane is called selectively permeable membrane?

Ans. The cell membrane is called selectively permeable membrane because it allows very few molecules to pass through it while blocks many other molecules.

18. What are the components of the cell membrane?

Ans. Cell membrane is composed of proteins and lipids and small quantities of carbohydrates.

19. What is fluid mosaic model?

Ans. The structure of cell membrane is described as fluid-mosaic model. According to this model the lipids make a fluid like bilayer in which protein molecules are submerged. The lipids and proteins can move laterally. Due to these movements, the pattern or "mosaic" of lipids and proteins constantly changes.

20. What are plasmodesmata?

Ans. Plasmodesmata (Singales: plasmadesma) are the channels in cell walls that allow the exchange of molecules between adjacent cells.

21. What is cytosol?

Ans. The liquid part of the cytoplasm that includes molecules and small particles, such as ribosomes, but not membrane-bound organelles is called cytosol.

22. What is cytoplasm?

Ans. Cytoplasm is the jelly-like substance that fills the inside of a cell. It is a complex mixture of water, proteins, enzymes, salts and other substances.

23. Write down the function of cytoplasm.

Ans. Cytoplasm provides a medium for organelles to move and function.

- It helps in the transport of materials throughout the cell.
- It also acts as the site for various metabolic reactions e.g; glycolysis (breakdown of glucose)
- It also stores food and wastes of the cell.

24. Which organelle does serve as the cell's control center?

Ans. The nucleus serves as the cell's control center. It oversees cellular activities by directing the production of proteins.

25. What is difference between nucleus in plant cells and in animal cells?

Ans. Nucleus in animal cells:

In animal cells, nucleus is present in the centers of the cell.

Nucleus in plant cells:

In mature plant cells, the nucleus is pushed to side due to a large central vacuole.

26. What is nuclear envelope?

Ans. Nuclear envelope is a double membrane that bounds the nucleus.

27. What is nucleoplasm?

Ans. The inner jelly like material of nucleus is called nucleoplasm.

28. What is chromatin?

Ans. Nucleoplasm contains fine thread like material known as chromatin.

29. What chromatin is composed of?

Ans. Chromatin is composed of de oxyribonucleic acid (DNA) and proteins.

30. What happens to chromatin when a cell starts dividing?

Ans. When a cell starts dividing, its chromatin condenses and takes the shape of thick chromosomes.

31. Why DNA is called the hereditary material?

Ans. DNA contains genes which control all the activities of the cell. DNA is also responsible for the transmission of characteristics to the next generation. That is why DNA is called the hereditary material.

32. Why chromosome in prokaryotic cells floats in cytoplasm?

Ans. In prokaryotic cells, there is no prominent nucleus so chromosome floats in cytoplasm.

33. What is a cytoplasm ?

Ans. Cytoplasm is a network of thin tubes and filaments present throughout the cytoplasm.

34. What are different parts of cytoplasm?

Ans. Cytoplasm consists of three parts i.e; microtubules, microfilaments and intermediate filaments.

35. Form which microtubules are made up?

Ans. Microtubules are hollow tubes made up of tubulin protein.

36. Discuss role of microtubules.

Ans.
- Microtubules hold organelles in place, maintain a cell's shape and act as tracks for organelles.
- They also make mitotic spindle, cilia and flagella.

37. From which microfilaments are made up?

Ans. Microfilaments are finer than microtubles. These are made up of contractile proteins mainly actin.

38. Explain function of microfilaments.

Ans. Microfilaments help in cell movement e.g., the crawing of white blood cells and the contraction of muscle cells.

39. From which intermediate filaments are made of?

Ans. Intermediate filaments are rods made of variety of proteins, mainly keratin and vimentin.

40. What are functions of intermediate filaments?

Ans.
- Intermediate filaments anchor the nucleus and some other organeller in the cell.
- They also make cell-to-cell junctions.

41. What are ribosomes?

Ans. Ribosomes are tiny granular structures. They are sites of protein synthesis.

42. Where ribosomes are located?

Ans. Ribosomes float freely in the cytoplasm and are also attached on the surface of rough endoplasmic reticulum.

43. What ribosomes are composed of?

Ans. Ribosomes are composed of almost equal amounts of proteins and ribosomal RNA (RNA).

44. How ribosomes play role during the protein synthesis?

Ans. Ribosomes are sites of protein synthesis. Each ribosome consists of two subunits. During the process of protein synthesis, the two subunits of a ribosome unite. When a ribosome has finished its work, its subunits get separated again.

45. What is endoplasmic reticulum. Where it is located in eukaryotic cells?

Ans. It is a network of membrane bounded channels present throughout the cytoplasm of eukaryotic cell.

46. How many types of endoplasmic reticulum are there? Name them.

Ans. There are two types of endoplasmic reticulum i.e; rough endoplasmic reticulum (RER) and smooth endoplasmic reticulum (SER).

47. Write function of rough endoplasmic reticulum (RER)

Ans. Numerous ribosomes are attached on the surface of the rough endoplasmic reticulum (RER).

Function:

Rough endoplasmic reticulum (RER) serves the function in protein synthesis.

48. Write functions of smooth endoplasmic reticulum (SER).

Ans. Smooth endoplasmic reticulum (SER) lacks ribosomes.

Function:

- It is involved in lipid metabolism.
- It is involved in the transport of materials from one part of the cell to the other.
- It also detoxifies the harmful chemicals.
- In muscle cells, SER is also involved in contraction process.

49. Who discovered Golgi apparatus?

Ans. In 1898, an Italian Physician named Camillo Golgi discovered a set of flattened sacs called cisternae in the cytoplasm that were stacked over each other. Golgi named this set of cisternae as Golgi apparatus or Golgi complex.

50. What is the function of golgi apparatus?

Ans. Golgi apparatus modifies molecules coming from rough endoplasmic reticulum and packs them into small membrane bound sacs called golgi vesicles.

51. What happen to golgi vesicles?

Ans. Golgi vesicles are kept in cell or are transported to exterior in the form of secretions.

52. What are lysosomes?

Ans. Lysosomes are small membrane bounded vesicles that contain digestive enzymes. They are predominantly found in animal cell.

53. Who discovered lysosomes?

Ans. The Belgian Scientist Christian Rene de Duve discovered lysosomes.

54. When Camillo Golgi was awarded Nobel Prize and for what?

Ans. In 1906 Camillo Golgi was awarded Nobel Prize for physiology and medicine.

55. Discuss functions of lysosomes.

Ans. Functions of Lysosomes:

- Cell engulfs the food material in the form of food vacuole. Lysosome bud off from Golgi apparatus, fuses with food vacuole and its digestive enzymes break down the food present in the vacoule.
- They also engulf the damaged organelles and break them.
- Lysosomes can store certain molecules for later use.

56. What are mitochondria?

Ans. Mitochondria (singular: mitochondrion) are the double membrane bounded structures found only in eukaryotes.

57. Which organelles of the cell are called the powerhouse of the cell?

Ans. Mitochondria are the powerhouse of the cell because they produce energy.

58. Why mitochondria are called the power house of the cell?

Ans. Mitochondria are called the powerhouse of the cell because they produce energy.

59. What is the function of the mitochondria?

Ans. Mitochondria perform the reactions of aerobic respiration in which oxygen is used to break food (glucose) to release energy (ATP-adenosine triphosphate).

60. What is difference between outer and inner membrane of the mitochondria?

Ans. Outer membrane:

The outer membrane of mitochondria is smooth.

Inner membrane:

The inner membrane of mitochondria forms many infoldings called cristae in the inner mitochondrial matrix.

61. What inner fluid like material of mitochondria is called?

Ans. The inner fluid like material of mitochondria is called matrix.

62. What do mitochondria contain?

Ans. Mitochondria contain their own DNA and ribosomes.

63. What the ribosomes of mitochondria are more similar to?

Ans. The ribosomes of mitochondria are more similar to prokaryotic ribosomes than to eukaryotic ribosomes.

64. What are plastids?

Ans. Plastids are membrane-bound organelles that only occur in plants and photosyntheic protists (algae).

65. How many plastids are there?

Ans. There are three main types of plastids.

- Chloroplasts
- Chromoplasts
- Leucoplasts

66. Whare are chloroplasts found?

Ans. Chloroplasts are green plastids present in the cells of green parts of plants and in algae.

67. Which plastids do contain chlorophyll?

Ans. Chloroplasts are the type of plastids that contain chlorophyll.

68. What do chloroplasts contain?

Ans. Chloroplasts contain chlorophyll.

69. What is chlorophyll?

Ans. Chlorophyll is a green pigment.

70. What is function of chloroplast?

Ans. Chloroplasts carry pigment charophyll. They carry out photosynthesis with the help of their photosynthetic pigments, they capture light energy and convert it into chemical energy in the form of glucose.

71. How many membranes does chloroplast have?

Ans. Cloroplast is enclosed within two membranes. The outer membrane is smooth while the inner membrane has sets of stacked membranes called grana (singular, granum). The sac like structures which make a granum are called thylakoids.

72. Where photosynthetic pigments chlorophylls are present?

Ans. Photosynthetic pigments chlorophyll are present on the surface of thylakoids.

73. What is stroma?

Ans. Stroma is a fluid that surrounds the thylakoids.

74. What do chloroplasts contain?

Ans. Chloroplasts contain DNA and ribosomes.

75. What do chromoplasts contain?

Ans. Chromoplasts are the plastids that contain pigments such as carotenoids.

76. Where type of are chromoplasts present ?

Ans. Chromoplasts are associated with bright colours. They are present in the cells of *flower* petals and fruits.

77. What is function of chromoplasts?

Ans. Chromoplasts give colours to petals and fruits and thus help in pollination and dispersal of fruit and seeds.

78. Which plastids do not have any pigment?

Ans. Leucoplasts are the plastids that have no pigments.

79. What is function of leucoplasts?

Ans. Leucoplasts store starches, lipids and proteins.

80. Where Leucoplasts are present?

Ans. Leucoplasts are present in the cells of those parts where food is stored e.g. underground stems, seeds, roots etc.

81. What are vacuoles ?

Ans. Vacuoles are single membrane bound sacs filled with fluid.

82. What is difference between vacuole in animal cell and vacuole in plant cell?

Ans. Vacuole in Animal cell:

Animal cells may have many small temporary vacuoles.

Vacuole in Plant cell:

Mature Plant cells have a single, large, central vacuole. It is formed by the fusion of many small vacuoles.

83. Which animals do contain contractile vacuoles?

Ans. Some freshwater organisms like amoeba and sponges have contractile vacuoles, which collect and pump aut entra water and other wastes.

84. What is function of food vacuoles?

Ans.
- Food vacuoles ingest food.
- They also store food.

85. What is tonoplast?

Ans. The membrane of plant vacuole is called tonoplast.

86. What is cell sap?

Ans. The rap inside plant vacuole is called cell sap. It is a watery solution of salts.

87. Why nucleus is pushed to a side in the plant cell?

Ans. Due to large central vacuole, the nucleus is pushed to a side in the plant cell.

88. What is turgor pressure?

Ans. Due to large central vacuole, the nucleus is pushed to a side, which makes the plant cells turgid. This pressure is called turgor pressure.

89. What are centrioles?

Ans. Centrioles are barrel shaped organelles found in the cells of animals and most protists. They are absent in prokaryotes, higher plants and fungi.

90. Discuss structure of centriole.

Ans. Each centriole is formed of a triplets of microtubule (made up of tubulin protein).

91. What is centrosome?

Ans. There is a pair of centrioles in which both centrioles are at right angles to each other. In animal cells, the pair is called centrosome and it is located near the nuclear envelope.

92. What is function of centrioles ?

Ans. Centrioles help in the formation of spindle fibers during cell division.

93. What are basal bodies?

Ans. The cells which have cilia and flagella contain centriole near cell membranes. These centrioles are called basal bodies.

94. What is function of basal bodies?

Ans. Basal bodies are involved in the formation of cilia and flagella.

95. When do centrioles divide?

Ans. At the start of cell division, the pair of centrioles duplicates.

96. What are cilia and flagella?

Ans. Cilia (singular cilium) and flagella (Singular flagellum) are thin, tail like projections.

97. What is difference between cilia and flagella?

Ans. Cilia are short in length and are usually numerous in number. On the other hand flagella are longer but less in number.

98. What eukaryotic cilia and flagella consist of?

Ans. Eukaryotic cilia and flagella consist of nine pairs of microtubules which surround a single central pair of microtubules. Cilia and flagella are connected to the basal body.

99. What prokaryotic flagella consist of?

Ans. Prokaryotic flagella are made of a protein called flagellin.

100. What is function of cilia and flagella?

Ans. The function of cilia and flagella is movement.

101. How ribosomes in prokaryotic cell are different from eukaryotic cell?

Ans. In prokaryotic cell, ribosomes are smaller while in eukaryotic cell, ribosomes are larger in size.

3.3 Structural Advantages of Plant and Animal Cells

3.4 + 35 Cell Specialization + Stem Cells

102. What cell wall in plants made of?

Ans. In plants the cell wall is rigid and it is made of cellulose.

103. What is function of cell wall?

Ans. Cell wall provides structural support and protection.

104. What are functions of large central vacuole in plants?

Ans.
- The large central Vacude in plants stores water, nutrients and waste products.
- It provides turgor pressure that maintains cell shape.

105. How plant cells are interconnected?

Ans. Plant cells are interconnected by plasmo-desmata, channels that allow direct communication and transport of substances between cells.

106. What is the role of chloroplasts?

Ans. Chloroplasts convert light energy into chemical energy, allowing plants to produce food.

107. What is the benefit of centrioles in animal cells?

Ans. In animal cells, centrioles make spindle fibres. This ensures the accurate distribution of chromosomes during cell division.

108. Explain advantage of lysosomes in animal cells?

Ans.
- In amimal cells, lysosomes break down waste materials.
- Lysosomes contribute to cellular cleanup and recycling.

109. How does flagellum help sperm cell?

Ans. Flagellum of sperm cell propel it towards the egg for fertilization.

110. Why do animal cells change shape easily?

Ans. Animal cells lack a rigid cell wall, allowing them to change the shape easily.

111. What is the benefit of lacking a rigid cell wall in the animal cells?

Ans. Due to lack of rigid cell wall, animal cells change the shape easily. This flexibility is crucial for cell movements, such as white blood cells moving to sites of infection or injury.

112. How cells are formed?

Ans. Cells are formed by cell division.

113. What do happen when cells undergo the process of specialization or differentiation?

Ans. During the process of specialization or differentiation, the cells get special sizes, structure and metabolic features. As a result, they become specialized.

114. What are mesophyll cells?

Ans. Mesophyll cells are green cells present in leaves.

115. What mesophyll cells are specialized for?

Ans. Mesophyll cells are specialized for photosynthesis.

116. What are epidermal cells?

Ans. Epidermal cells are flat and tightly packed cells that make the outer layer (epidermis) of plant organs.

117. What is function of epidermis?

Ans. Epidermis protects the internal tissues.

118. What is the function of epidermis of root?

Ans. Epidermis of root contains root hair cells. These cells make extensions called root hairs which absorb water and minerals from the soil.

119. What is the importance of lower epidermis of leaves?

Ans. The lower epidermis of leaves contains guard cells which regulate opening and closing of stomata.

120. What are muscle cells?

Ans. Muscle *cells* are specialized animal cells that can contract. They are elongated *cells* filled with actin and other contractile proteins.

121. What are different types of muscle cells?

Ans. There are three types of muscle cells i.e; skeletal muscle cells, cardiac muscle cells and smooth muscle cells.

122. What are skeletal muscle cells?

Ans. Skeletal muscle cells are long, striated. They are attached to bones. They are voluntary in action and their contractions move the skeleton for body movements and locomotion.

123. What are Cardiac muscle cells ?

Ans. Cardiac muscle cells are branched and striated. They are found in the heart walls. They are involuntary in action and their contractions result in the pumping action of heart.

124. What are smooth muscle cells?

Ans. Smooth muscle cells are spindle shaped and non striated. They are involuntary in action and are present in the walls of many internal organs: For example, smooth muscles in the alimentary canal contract to move food forward, while those in blood vessels regulate blood flow.

125. What is the function of smooth muscles cells in the alimentary canal?

Ans. The smooth muscles in the alimentary canal contract to move food forward.

126. Discuss the function of smooth muscles in the blood vessels?

Ans. The smooth muscles in the blood vessels regulate blood flow.

127. Name the specialized cells of the nervous system.

Ans. The specialized cells of the nervous system are called neurons.

128. Explain the function of neurons ?

Ans. Neurons are responsible for transmitting messages (nerve impulses) throughout the body.

129. Discuss the structure of a neuron.

Ans. Structure of a Neuron:

A neuron consists of a cell body and two types of cytoplasmic extensions, i.e; dendrites and axons.

Dendrites:

Dendrites are the shorter extensions.

Function:

Dendrites receive the nerve impulses. and transmit them to the cell body.

Axons:

Axons are the longer extensions.

Function:

Axons carry nerve impulses away from the cell body.

130. What is difference between dendrites and axons?

Ans.

Dendrites	Axons
There are the shorter extensions of the neurons.	There are the longer extensions of the neurons.
They receive nerve impulses and transmit them to the cell body.	They carry nerve impulses away from the cell body

131. What are red blood cells (Erythrocyte)?

Ans. Red blood cells (erythrocytes) are specialized cells that carry oxygen from the lungs to the body's tissues.

132. What is shape of red blood cells ?

Ans. Red blood cells are biconcave disk sheped cells.

133. What is the advantage of biconcave disk shape of red blood cells?

Ans. Biconcave disk shaped of red blood cells provides more surface area to absorb and release oxygen.

134. What red blood cells are filled with?

Ans. Red blood cells are filled with haemoglobin that actually carries oxygen.

135. Explain what mature red blood cells do not contain in mammals.

Ans. In mammals, the mature red blood cells do not contain nucleus, mitochondria and endoplasmic reticulum etc. It helps to accomodate more haemoglobin.

136. Which cells are called hepatocytes?

Ans. Liver cells are called hepatocytes.

137. What are the functions of the liver cells?

Ans. Liver cells are specialized for a lot of following functions like:

- Storage of glycogen, iron and some vitamins.
- Detoxification of toxic substances.
- Production of clotting proteins of blood.
- Recycling of old red blood cells.

138. Why nuclei in liver cells are required?

Ans. In liver cells, nuceli are required for making of enzymes and other proteins.

139. Explain importance of large number of mitochondria in liver cells?

Ans. In liver cells, large number of mitochondria provide the necesary ATP for energy-intensive processes.

140. Tell the advantage of network of SER in liver cells ?

Ans. In liver cells, expansive network of SER helps for extensive detoxification and liquid synthesis.

141. What is function of peroxisomes in liver cells?

Ans. In liver cells, there are large number of peroxisomes which contain enzymes to neutralize toxic substances.

142. Who collect and transport the bile to the bile ducts?

Ans. Small ducts are present between liver cells which collect and transport their secretion (bile) to the bile ducts.

143. What does division of labour refer?

Ans. Division of labour refers to the specialization of different parts of a system to perform specific tasks more efficiently.

144. From where all different types of cells arise in sexually reproducing organisms?

Ans. In sexually reproducing organisms all different types of cells arise from a single cell (Zygote).

145. What is zygote?

Ans. Zygote is an unspecialized cell but it has the ability to make new cells which can differentiate into specialized cells.

146. Define the term "stem cell".

Ans. Stem cell:

Such unspecialized cell which has the ability to differentiate into a variety of specialized cell types is called stem cell.

147. How cells of different cell lines differentiate into specific cell type?

Ans. During development, when the earliest stem cell (zygote) divides, it makes different cell lines. The cells of each line differentiate into specific type like skin cells, muscle cells, nerve cells, blood cells etc.

148. What are the importance of stem cells?

Ans. Importance of stem cells:

- Stem cells remain in different parts of the body throughout life.
- Stem cells divide and differentiate into specific cells as the body needs them.
- Stem cells regenerate damaged tissue under the right conditions.

149. What is the function of stem cells present in skin?

Ans. Stem cells present in skin help in wound healing.

150. Explain the function of stem cells present in liver.

Ans. Stem cells present in liver help it to repair after damage.

151. Discuss function of stem cells present in bone marrow.

Ans. Stem cells present in bone marrow differentiate to make different types of blood cells and immune cells.

152. What is the function of adult stem cells in the gut and bone marrow?

Ans. In gut and bone marrow, adult stem cells regularly divide to produce new tissues for maintenance and repair.

Conceptual Short Questions

1. Which organelle is known as the brain of the cell?

Ans. The nucleus is known as the brain of the cell because it controls all the activities of the cell.

2. Which organelle is semi permeable?

Ans. The cell organelles that are semi-permeable include lysosome, mitochondria, chloroplast, endoplasmic reticulum, plastids, vacuoles and nucleus.

3. Which is the smallest organelle of the cell?

Ans. Ribosomes are the smallest cell organelles. They are not membrane bound and have important role in synthesis of proteins. They are found in both prokaryotic and eukaryotic cells.

4. What is difference between an organ and an organelle?

Ans. An organ is a collection of tissues that performs a specific function in the body. An organelle is a cellular structure that performs specific function within the cell.

5. What is difference between chromatin and chromosomes?

Ans. Chromatin:

It is a loose thread like form of genetic material found in nucleus of the cell.

Chromosomes:

In prophase, the chromatin condenses and become thick and changes into proper structures known as chromosomes.

Exercise Questions

A. Select the correct answers for the following questions.

1. The process of cellular respiration occurs in:

a) Nucleus b) Mitochondria c) Ribosomes d) Golgi apparatus

2. The smooth endoplasmic reticulum (SER) is primarily involved in the synthesis of:

a) Proteins b) Lipids c) Carbohydrates d) Nucleic acids

3. Ribosomes are composed of:

a) RNA and protein b) DNA and protein

c) Carbohydrates and lipids d) RNA and carbohydrates

4. What is the primary function of ribosomes?

a) Energy production b) Protein synthesis

c) Lipid synthesis d) DNA synthesis

5. Which cell organelle is involved in packaging and modifying proteins?

a) Nucleus b) Mitochondria

c) Golgi apparatus d) Endoplasmic reticulum

6. Which cell organelle is responsible for breaking down waste materials?

a) Golgi apparatus b) Nucleus c) Mitochondria d) Lysosome

7. Which of the following cell structures is involved in maintaining cell shape?

a) Cytoskeleton b) Centrioles c) Nucleus d) Lysosome

8. Which specialized region of the nucleus is responsible for ribosome assembly?

a) Nucleoplasm b) Nucleolus c) Chromatin d) Chromatin

9. What is the main function of the nuclear pores?

a) Regulation of cell division b) Protein synthesis

c) Control of pH of the cell d) Control of transport of molecules

10. Which of the following cellular structures is found in animal cells and helps in cell division?

a) Cell membrane b) Centriole c) Plasmodesma d) Vacuole

11. Which sub-cellular organelle plays a crucial role in energy production within the cell?

a) Endoplasmic reticulum b) Golgi apparatus

c) Mitochondria d) Lysosomes

12. **In a multicellular plant, which cell type is responsible for the production of glucose?**
a) Xylem b) Phloem c) Epidermal d) Mesophyll

13. **Which organelle can double its number by itself?**
a) Ribosomes b) Lysosomes c) Mitochondria d) Golgi apparatus

14. **Which of these are present on the surface of rough endoplasmic reticulum?**
a) Ribosomes b) Lysosomes c) Mitochondria d) Vacuoles

ANSWERS:

1.	(b)	2.	(b)	3.	(a)	4.	(b)	5.	(c)	6.	(d)	7.	(a)
8.	(b)	9.	(d)	10.	(b)	11.	(c)	12.	(d)	13.	(c)	14.	(a)

B. Write short answers.

1. **What are the main functions of cell membrane?**

Ans. The main function of cell membrane is it allows only few molecules to pass through it while blocks many other molecules.

2. **What key role does the Golgi apparatus play in eukaryotic cells?**

Ans. In eukaryotic cells golgi apparatus is responsible for transporting, modifying and packaging proteins and lipids into vesicles for delivery to targeted destinations.

3. **How do lysosomes contribute to the cell's functioning?**

Ans.
- Lysosome fuses with food vacuole and its digestive enzymes break down the food present in vacuole.
- They also engulf the damaged organelles and break them.
- Lysosomes can store certain molecules for later use.

4. **Which organelle detoxifies harmful substances and breaks down lipids?**

Ans. Smooth endoplasmic reticulum (SER) detoxifies harmful substances and breaks down lipids.

5. **What is the smooth endoplasmic reticulum responsible for?**

Ans. Smooth endoplasmic reticulum (SER) is involved in lipid metabolism.
- It is involved in the transport of materials from one part of the cell to the Other.
- It also detoxifies the harmful chemicals that have entered the cell.

6. **How do the vacuoles in plant cells differ from vacuoles in animal cells?**

Ans. In plant cells, there is a single, large, central vacuole, while in animal cells, there are many small vacuoles scattered in the cytoplasm.

7. **What could happen if lysosomal enzymes stop working properly?**

Ans. Lysosomal enzymes break cellular wastes. When lysosomal enzymes do not work properly, sugars and fats build up in the cell instead of being used or excreted.

8. **Why are the cristae important for cellular respiration?**

Ans. The cristae play a vital role in cellular respiration by providing a large surface area.

9. **How are chromatin and chromosomes related?**

Ans. Chromatin is fine thread-like material. It is composed of deoxyribonucleic acid

(DNA) and proteins. When a cell starts dividing, its chromatin condenses and takes the shape of thick chromosomes.

10. Which type of cell is responsible for sending nerve signals?

Ans. Neuron is the cell that is responsible for sending nerve signals.

11. What do mesophyll cells do in plant leaves?

Ans. Mesophyll cells contain large number of chloroplasts, which contain the green pigment chlorophyll necessary for capturing light energy. Mesophyll cells are responsible fo rphotosynthesis.

12. How would you define a stem cell?

Ans. Unspecialized cell that has the ability to differentiate into a variety of specialized cell types is called stem cell.

13. Name the chemical compounds that make up:

a. Cell membrane **b.** Fungal cell wall
c. Plant cell wall **d.** Bacterial cell wall
e. Ribosomes **f.** Chromosomes

Ans. a. Cell membrane: Cell membrane is composed of proteins and lipids and small quantities of carbohydrates.

b. Fungal cell wall: Fungal cell wall is made up of Chitin.

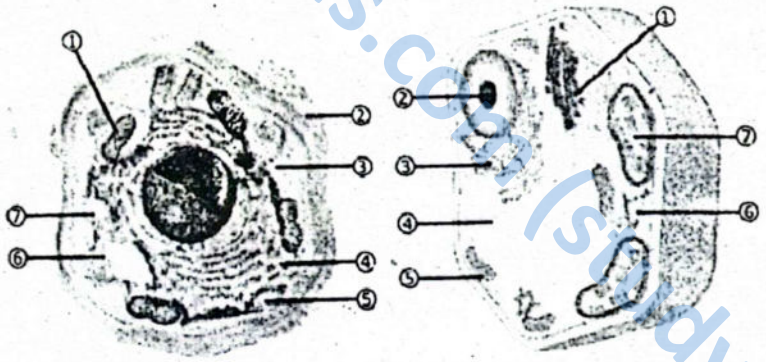
c. Plant cell wall: Plant cell wall is made up of cellulose.

d. Bacterial cell wall: Bacterial cell wall is made up of peptidoglycan.

e. Ribosomes: Ribosomes are emade up of proteins and ribosomal RNA (rRNA).

f. Chromosomes: Chromosomes are made up of DNA and proteins.

14. Label the parts of these cell diagrams?



Ans.

Animal cell	Plant cell
1. Mitochondria	1. Mitochondria
2. Cell membrane	2. Nucleus
3. Golgi complex	3. Golgi complex
4. Vacuole	4. Vacuole
5. Ribosome	5. Chloroplast
	6. Ribosome
	7. Mitochondrion

C. Write answers in detail.

1. Explain the fluid mosaic model of the cell membrane.

Ans. For answer see Q.No. 4

2. Describe the structure and functions of the cell wall.

Ans. For answer see Q.No. 3

3. Discuss the components of the nucleus.

Ans. For answer see Q.No. 6

4. Describe the structure and function of lysosome and endoplasmic reticulum.

Ans. Lysome: For answer see Q.No. 11

Endoplasmic reticulum: For answer see Q.No. 9

5. Describe the formation and function of the Golgi complex.

Ans. For answer see Q.No. 10

6. Describe the structure and functions of the chloroplast.

Ans. For answer see Q.No. 13

7. How does turgor pressure develop in a plant cell?

Ans. For answer see Q.No. 14

8. Write any four differences between a plant cell and an animal cell.

Ans. For answer see Q.No. 16

9. Describe the concept of division of labour and how it applies in multicellular organisms. Give at least three examples.

Ans. For answer see Q.No. 20

10. Write a note on cell specialization.

Ans. Cell specialization:

In multicellular organisms, all cells are not exactly alike. Rather, there are different types of cells. Each type has a special structure and performs special function. When cells are formed by cell division, they are all similar. After their formation, cells undergo the process of specialization or differentiation. During this process, they get special sizes, structures, and metabolic features. As a result, they become specialized.

D. Inquisitive Questions.

1. What impact might mitochondrial dysfunction or absence have on other organelles ability to operate in a cell?

Ans. If a cell mitochondrial might dysfunction or absence the other organelles will not be able to function properly because the cell will not produce enough energy to proceed normal functioning of cell. If will leading to impaired cellular functions, stress and potentially even cell death.

2. What may happen if the coordination between the ribosomes and the nucleus were to fail, and why is it so important?

Ans. The coordination between the ribosome and nucleus is crucial for mantaing proper protein synthesis, cellular functions and homeostasis. If this coordination is disturb it will lead to severe cellular consequences regarding structural and functioning.