

Cell the unit of Life

1. What is Cell?

Ans. The cell is the basic structural building block of living organisms consisting of protoplasm (living substance) enclosed by a cell membrane with an additional cell wall in plant cells, and having a nuclear membrane or without it.

2. What is Cell Theory?

Ans. A year later German Scientist Theodor Schwann made similar discoveries in animals. He declared that, all animals and plants are composed of cells, which serve as the units of structure and function. This, in short, is called the Cell Theory.

3. Why cell is called structural and functional unit of life?

Ans. The cell is called the structural and functional unit of life as all living organisms are made up of cells. Cells are also essential for performing various life processes required for sustaining life. Furthermore, cells provide form and structure, process nutrients and convert it into useable energy. Multicellular organisms have specialized cells that perform specific functions.

For instance, the blood contains RBC and this cell is primarily tasked with transporting oxygen and carbon dioxide. Another example of a specialised cell is the photoreceptor cell found in the eye. This type of cell is tasked with converting light into signals capable of influencing biological processes.

4. What are the major points of the Cell theory?

Ans. The Cell Theory states three major points.

- a. The cell is the smallest unit of structure of all living things.
- b. The cell is the unit of function of all living things.
- c. All cells arise from pre-existing cells.

5. Why the cells are small in size?

Ans. Cells generally remain small in size and this is because of two main reasons.

- a. Different regions of a cell can communicate with each other rapidly for the cell to function effectively.
- b. Cells have a large surface area/volume ratio for greater diffusion of the substances in and out of the cell.

6. What are the main parts of the Cell?

Ans. A generalized cell consists of three essential parts:

- a. Cell Membrane or Plasma Membrane
- b. Nucleus
- c. Cytoplasm

7. What are Cell Organelles?

Ans. Most parts of a cell have a definite shape, a definite structure and a definite function. Such parts are called organelles.

Cell organelles are the living parts.

The organelles have the same status in a cell as the organs have in the entire body of an animal or a plant performing specific function.

8. What is Cell Membrane?

Ans. The cell membrane is a biological membrane that separates the interior of all cells from the outside environment which protects the cell from its environment. The cell membrane consists of a lipid bilayer, including cholesterol that sit between phospholipids to maintain their fluidity at various temperatures.

9. What are the characteristics of Cell Membrane?

Ans. The characteristic of Cell Membrane is:

- a. The cell membrane has fine pores through which substances, may enter or leave the cell.
- b. Cell membrane is composed of protein.
- c. The permeability of the cell membrane is selective i.e., it allows only substances to pass through while it prevents others.

10. What is Cell Wall?

Ans. A cell wall is a structural layer surrounding plant cells, just outside the cell membrane. It can be tough, flexible, and sometimes rigid. It provides the cell with both structural support and protection, and also acts as a filtering mechanism.

11. What are the characteristics of Cell Wall?

Ans. The characteristics of Cell Wall are

- a. The cell wall gives shape and a certain degree of rigidity to the cell without interfering with the functions of the cell membrane.
- b. The cell wall is freely permeable allowing the substances in solution to enter and leave the cell without hindrance.

12. What is Cytoplasm?

Ans. Cytoplasm is a semi-liquid substance. It occupies most part of the cell within the cell membrane.

13. What are the functions of Cytoplasm?

Ans. One of the major functions of cytoplasm is to enable cells to maintain their turgidity, which enables the cells to hold their shape. Other functions of cytoplasm are as follows:

- The jelly-like fluid of the cytoplasm is composed of salt and water and is present within the membrane of the cells and embeds all of the parts of the cells and organelles.
- The cytoplasm is home to many activities of the cell as it contains molecules, enzymes that are crucial in the breakdown of the waste.
- The cytoplasm also assists in metabolic activities.
- Cytoplasm provides shape to the cell. It fills up the cells thus enabling the organelles to remain in their position. The cells, without cytoplasm, would deflate and substances will not permeate easily from one to the other organelle.
- A part of the cytoplasm, the cytosol has no organelles. Rather, the cytosol is enclosed by matrix boundaries that fill up the cell section which does not hold the organelles.

14. What is Endoplasmic Reticulum?

Ans. The Endoplasmic Reticulum is very fine irregular network of double membranes distributed over the entire cytoplasm in a cell.

15. Endoplasmic Reticulum are how many types?

Ans. Endoplasmic Reticulum are two types:

- a. Rough Endoplasmic Reticulum
- b. Smooth Endoplasmic Reticulum

16. What are the characteristics of Rough Endoplasmic Reticulum?

Ans. The characteristics of Rough Endoplasmic Reticulum are

- The rough endoplasmic reticulum is named so because of its appearance.
- It is a series of connected flattened sacs having several ribosomes on its outer surface, hence the name.
- It synthesizes and secretes proteins in the liver, hormones and other substances in the glands.
- Rough ER is prominent in cells where protein synthesis happens (such as hepatocytes)
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17. What are the functions of Rough Endoplasmic Reticulum?

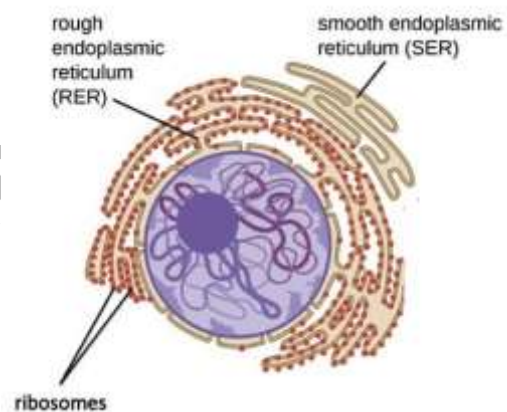
Ans. The functions of Rough Endoplasmic Reticulum are

- The majority of the functions of rough ER is associated with protein synthesis.
- Rough endoplasmic reticulum also plays a vital role in protein folding.
- Also ensures quality control (regarding correct protein folding).
- The second most important function after protein synthesis and protein folding is protein sorting.

18. What are the characteristics of Smooth Endoplasmic Reticulum?

Ans. The characteristics of Smooth Endoplasmic Reticulum are

- The smooth endoplasmic reticulum, on the other hand, does not have ribosomes.
- The smooth endoplasmic reticulum has a tubular form.
- It participates in the production of phospholipids, the chief lipids in cell membranes and are essential in the process of metabolism.
- Smooth ER transports the products of the rough ER to other cellular organelles, especially the Golgi apparatus.



19. What are the functions of Smooth Endoplasmic Reticulum?

Ans. The functions of Smooth Endoplasmic Reticulum are

- Smooth ER is responsible for the synthesis of essential lipids such as phospholipids and cholesterol.
- Smooth ER is also responsible for the production and secretion of steroid hormones.
- It is also responsible for the metabolism of carbohydrates.
- The smooth ER store and release calcium ions. These are quite important for the nervous system and muscular system.

20. What are Ribosomes?

Ans. A ribosome is a complex molecular machine found inside the living cells that produce proteins from amino acids during the process called protein synthesis or translation. The process of protein synthesis is a primary function, which is performed by all living cells.

21. What is a ribosome composed of?

Ans. A ribosome is composed of two subunits:

- the small ribosomal subunits- these read the mRNA
- the large ribosomal subunits- they form polypeptide chains of amino acids.

22. What are the two different types of ribosomes?

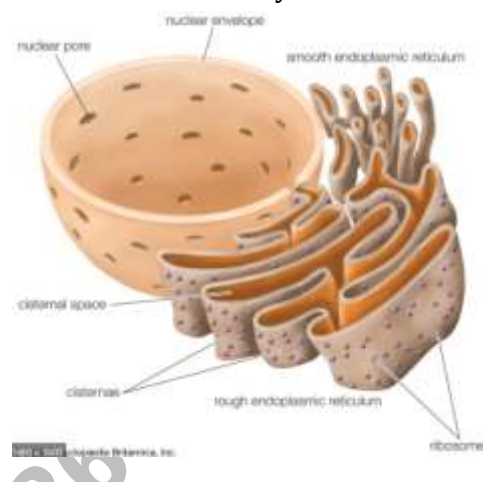
Ans. The two different types of ribosomes include:

- a. 70 S-found in prokaryotic cells
- b. 80 S-found in eukaryotic cells

23. What are the functions of Ribosome?

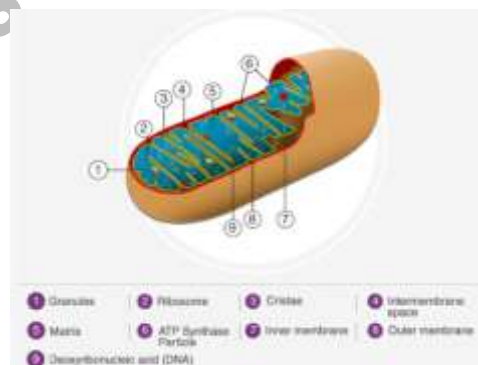
Ans. The important ribosome function includes:

- a. It assembles amino acid to form proteins that are essential to carry out cellular functions.
- b. The DNA produces mRNA by the process of DNA transcription.
- c. The mRNA is synthesized in the nucleus and transported to the cytoplasm for the process of protein synthesis.
- d. The ribosomal subunits in the cytoplasm are bound around mRNA polymers. The tRNA then synthesizes proteins.
- e. The proteins synthesized in the cytoplasm are utilized in the cytoplasm itself, the proteins synthesized by bound ribosomes are transported outside the cell.



24. What are Mitochondria?

Ans. The Mitochondria (Single: Mitochondrion) are spherical, rod-shaped or thread like structure. There are minute double walled bags with their inner walls produced into finger like processes projecting inwards. Mitochondria are the sites where cell respiration occurs to release energy.



25. Why Mitochondria is called as Power house of the cell?

Ans. Mitochondria are the sites where cell respiration occurs to release energy. This energy is stored in the form of an energy-rich compound ATP (Adenosine Triphosphate) and is used in various metabolic functions of the cell, and in turn, of the body. Some people call the mitochondria as "power houses of the cell".

26. What are the Functions of Mitochondria?

Ans. The most important function of mitochondria is to produce energy through the process of oxidative phosphorylation. It is also involved in the following process:

- a. Regulates the metabolic activity of the cell
- b. Promotes the growth of new cells and cell multiplication
- c. Helps in detoxifying ammonia in the liver cells
- d. Plays an important role in apoptosis or programmed cell death
- e. Responsible for building certain parts of the blood and various hormones like testosterone and estrogen
- f. Helps in maintaining an adequate concentration of calcium ions within the compartments of the cell
- g. It is also involved in various cellular activities like cellular differentiation, cell signaling, cell senescence, controlling the cell cycle and also in cell growth.

27. What is Golgi Body?

Ans. The Golgi apparatus occurs in the form of granules, filaments or rods which are supposed to be originated from endoplasmic reticulum. These are very small vesicles of different shapes, and are generally located near the nucleus. The Golgi complex consists of many small groups of hollow tubular structures with membranous walls and is associated with some minute vesicles and vacuoles. It is concerned with the secretions of the cell including enzymes, hormones, etc.

28. What is Lysosomes?

Ans. Lysosomes are small vesicles of different shapes containing some digestive enzymes. Their enzymes destroy and digest foreign substances around them. They digest the stored food during starvation of the cell.

29. Why Lysosome are called Suicide Bag of the cell?

Ans. Many damaged cells are rapidly destroyed or dissolved by their own lysosomes and hence these are also called the "suicide bags".

30. What are the main functions of Lysosomes?

Ans. The key function of lysosomes is digestion and removal of waste. Cellular debris or foreign particles are pulled in to the cell through the process of endocytosis. The process of endocytosis happens when the cell membrane falls in on itself (invagination), creating a vacuole or a pouch around the external contents and then bringing those contents into the cell.

On the other hand, discarded wastes and other substances originating from within the cell is digested by the process of auto phagocytosis or autophagy. The process of autophagy involves disassembly or degradation of the cellular components through a natural, regulated mechanism.

31. What is Centrosome and Centrioles?

Ans. A centrosome is an organelle found in cells that comprises two centrioles. A centriole is a structure found in a cell that involves microtubules that are orchestrated with a certain goal in mind.

32. What are the functions of Centrioles?

Ans. Following are the important Centrioles function:

- a. In spite of being devoid of DNA, the centrioles are capable of forming new centrioles.
- b. They can be transformed into basal bodies.
- c. The basal bodies give rise to flagella and cilia.
- d. They help in cell division by forming microtubule organizing centers.
- e. Out of the two centrioles, the distal centriole forms the tail or axial filament.

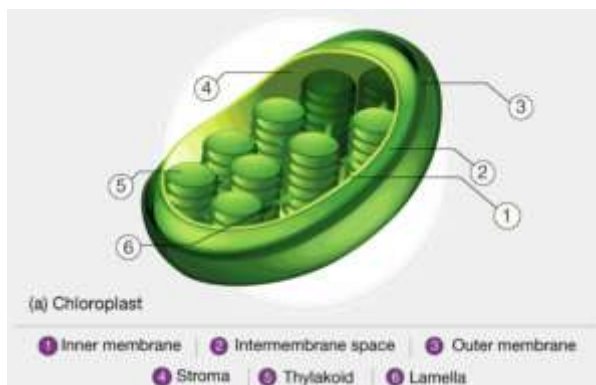
33. What is Plastid?

Ans. Plastids refer to the double membrane bound organelles found in plant cells. They are found in the cytoplasm. Plants make and store food in plastids. They have their own DNA and Ribosomes.

34. Plastids are how many types?

Ans. Plastids are three types:

- a. Leucoplasts
- b. Chromoplasts
- c. Chloroplasts



35. What are Leucoplasts?

Ans. These are the non-pigmented organelles which are colourless. Leucoplasts are usually found in most of the non-photosynthetic parts of the plant like roots. They act as a storage sheds for starches, lipids, and proteins depending on the need of the plants. They are mostly used for converting amino acids and fatty acids.

36. What are Chromoplasts?

Ans. Chromoplasts is the name given to an area for all the pigments to be kept and synthesized in the plant. These can be usually found in flowering plants, ageing leaves and fruits. Chloroplasts convert into chromoplasts. Chromoplasts have carotenoid pigments that allow different colours that you see in leaves and fruits. The main reason for its different colour is for attracting pollinators.

37. What are Chloroplasts?

Ans. Chloroplasts are biconvex shaped, semi-porous, double membraned, cell organelle found within the mesophyll of the plant cell. They are the sites for synthesizing food by the process of photosynthesis.

38. What are Granules?

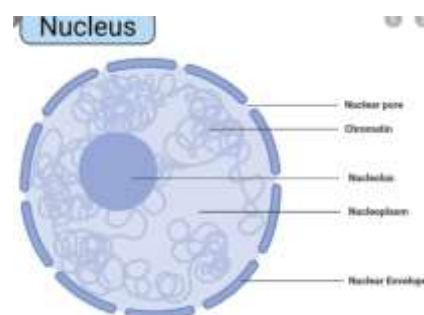
Ans. Granules are many small nonliving particles in the cytoplasm and such particles are believed to contain food materials, such as starch, glycogen and fats.

39. What are Vacuoles?

Ans. Vacuoles are the nonliving particles of a cell. These are certain clear spaces in the cytoplasm. They are filled with water and various substances in solution. In plant cells the vacuoles are usually quite large and the liquid which they contain is called cell-sap. An animal cell does not have such prominent vacuoles, and the vacuoles are fewer in number.

40. What is Nucleus?

Ans. A nucleus is defined as a double-membraned eukaryotic cell organelle that contains the genetic material. It is located somewhat in the centre of the cytoplasm. It has a delicate nuclear membrane which is filled with a relatively dense nucleoplasm.



41. What is the importance of Nucleus?

Ans. Nucleus is the most important part of the cell.

- It regulates and coordinates various life processes of the cell.
- It plays an important part in cell division.
- It contains factors (genes) which determine heredity.
- The nucleolus participates in protein synthesis.

42. What is Chromatin Fiber?

Ans. In the nucleoplasm there are certain threadlike structures called Chromatin Fibre. During cell division the Chromatin Fibre. become thick and ribbon-like. These fibres are then called chromosomes.

The main functions of Chromatin Fibre are

- Preventing DNA damage.
- Tightly packing of the DNA to fit into the cell.
- Control the DNA replication and gene expression.
- Support the DNA molecule to permit the process of cell cycle – meiosis and mitosis.

43. What are Procaryotic Cell?

Ans. Cells in which nuclear membrane is absent are called Prokaryotic cells. They have nuclear material called chromatin fibres which occur freely in the cytoplasm e.g. bacteria.

44. What are Eukaryotic cells?

Ans. Cells in which double nuclear membrane is present are called Eukaryotic cells e.g. all organisms other than bacteria.

45. Write the differences between Plant Cell and Animal Cell?

Ans.

Characteristics	Plant Cell	Animal Cell
Cell Shape	Square or rectangular in shape	Irregular or round in shape
Cell Wall	Present	Absent
Plasma/Cell Membrane	Present	Present
Endoplasmic Reticulum	Present	Present
Nucleus	Present and lies on one side of the cell	Present and lies in the centre of the cell
Lysosomes	Present but are very rare	Present
Centrosomes	Absent	Present
Golgi Apparatus	Present	Present
Cytoplasm	Present	Present
Ribosomes	Present	Present
Plastids	Present	Absent
Vacuoles	Few large or a single, centrally positioned vacuole	Usually small and numerous
Cilia	Absent	Present in most of the animal cells
Mitochondria	Present but fewer in number	Present and are numerous
Mode of Nutrition	Primarily autotrophic	Heterotrophic

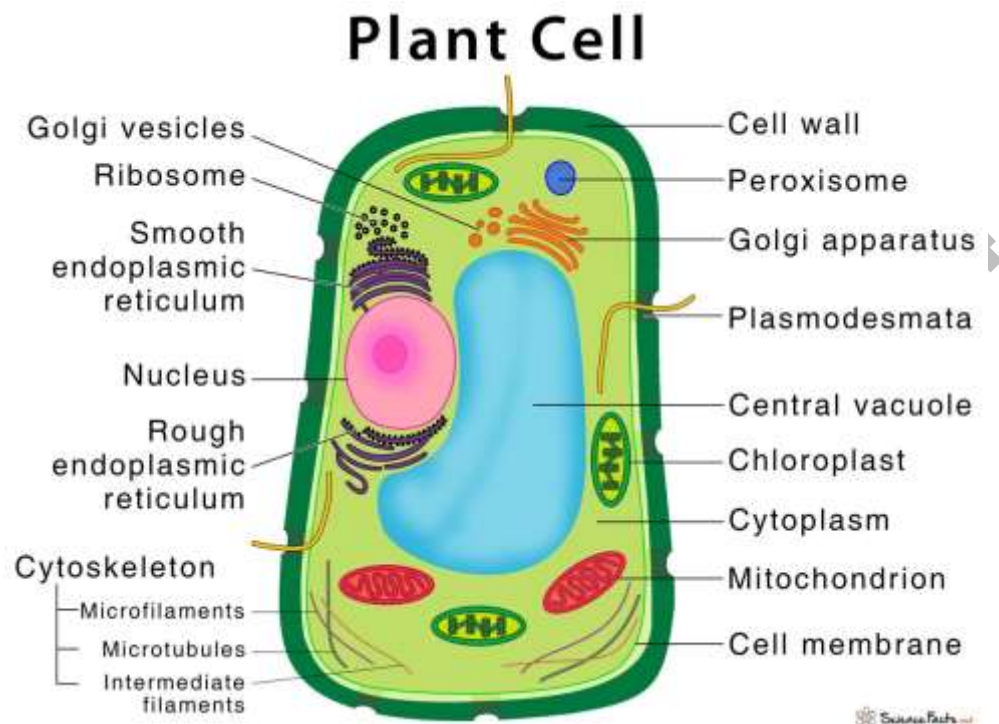
46. Write the difference between Procaryotic and Eucaryotic Cell.

Ans.

	Procaryotic Cell	Eukaryotes Cell
Type of Cell	Always unicellular	Unicellular and multi-cellular
Cell size	Ranges in size from 0.2 μm – 2.0 μm in diameter	Size ranges from 10 μm – 100 μm in diameter
Cell wall	Usually present; chemically complex in nature	When present, chemically simple in nature
Nucleus	Absent.	Present
Ribosomes	Present. Smaller in size and spherical in shape	Present. Comparatively larger in size and linear in shape
DNA arrangement	Circular	Linear
Mitochondria	Absent	Present
Cytoplasm	Present, but cell organelles absent	Present, cell organelles present
Endoplasmic reticulum	Absent	Present
Plasmids	Present	Very rarely found in eukaryotes
Ribosome	Small ribosomes	Large ribosomes
Lysosome	Lysosomes and centrosomes are absent	Lysosomes and centrosomes are present
Cell division	Through binary fission	Through mitosis
Flagella	The flagella are smaller in size	The flagella are larger in size
Reproduction	Asexual	Both asexual and sexual
Example	Bacteria and Archaea	Plant and Animal cell

47. Draw a line diagram of Plant cell.

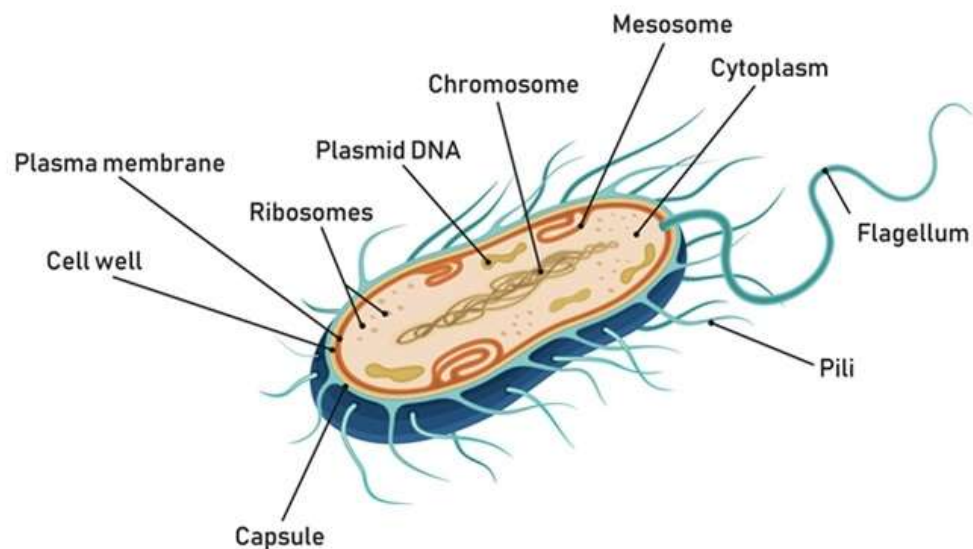
Ans.



48. Draw a diagram of Bacteria Cell.

Ans.

STRUCTURE OF A BACTERIAL CELL



49. Draw a diagram of Animal Cell.
Ans.

