CELL - THE FUNDAMENTAL UNIT OF LIFE

Review Questions (Page 10 – 11)

Very Short Answer Type Questions

1. What is a cell?

Answer: A cell is the smallest structural and functional unit of a living organism capable of performing life processes.

2. What is the structural and functional unit of life?

Answer: The cell.

3. What are three basic criteria for defining the cell?

Answer: It is the smallest unit capable of performing life functions. It contains genetic material for heredity. It is enclosed by a membrane that regulates exchange with the environment.

4. Give any three examples of unicellular organisms.

Answer: Amoeba, Paramecium, Bacteria.

5. Give any three examples of multicellular organisms.

Answer: Humans, Plants, Animals (e.g., Dog, Mango tree, Elephant).

Short Answer Type Questions

1. Differentiate a plant cell and an animal cell.

Answer:

Feature	Plant Cell	Animal Cell
Cell Wall	Present (made of cellulose)	Absent
Chloroplasts	Present (for photosynthesis)	Absent

Feature	Plant Cell	Animal Cell
Vacuole	Large, central vacuole	Small or absent
Shape	Fixed, usually rectangular	Flexible, usually irregular
Centrioles	Absent	Present (involved in cell division)

2. Differentiate prokaryotic cell and eukaryotic cell.

Answer:

Feature	Prokaryotic Cell	Eukaryotic Cell
Nucleus	Absent (nucleoid region)	Present (well-defined nucleus)
Membrane-bound organelles	Absent	Present (e.g., mitochondria, ER)
Size	Smaller (1-10 μm)	Larger (10-100 μm)
Genetic Material	Single, circular DNA	Multiple, linear chromosomes
Example	Bacteria, Cyanobacteria	Plants, Animals, Fungi

3. Describe cell theory.

Answer: Cell theory states: All living organisms are composed of one or more cells. The cell is the basic structural and functional unit of life. All cells arise from pre-existing cells. Proposed by Schleiden, Schwann, and Virchow.

4. "Cell is the structural and functional unit of life" Justify it.

Answer: The cell is the smallest unit capable of performing all life processes like metabolism, reproduction, and response to stimuli. Structurally, it forms the building blocks of organisms, and functionally, it carries out essential processes through organelles like the nucleus (controls activities), mitochondria (energy production), and ribosomes (protein synthesis).

5. Write a short note on size of cell.

Answer: Cells vary greatly in size. The smallest cells, like Mycoplasma (PPLO), are about 0.1-0.5 μm, while the largest, like an ostrich egg, can be several centimetres. Most cells are microscopic (1-100 μm). Size depends on

function; for example, nerve cells are long for signal transmission, while red blood cells are small for efficient oxygen transport.

Fill in the Blanks

1. Prokaryotic cells are found in **bacteria** and **cyanobacteria**.

2. Membrane-less nuclear area found in prokaryotic cells is called **nucleoid**.

3. Cell organelles are well developed in **eukaryotic** cells.

4. Typical chromosomes are found in **eukaryotic** cells.

5. The cell theory was given by **Schleiden** and **Schwann**.

True or False

1. In eukaryotic cells, the genetic material is not surrounded by a nuclear membrane.

Answer: False (Eukaryotic cells have a well-defined nucleus with a nuclear membrane).

2. Well-defined organelles are found in prokaryotic cells.

Answer: False (Prokaryotic cells lack membrane-bound organelles).

3. Plant cells are bounded by a wall composed of cellulose.

Answer: True.

4. Amoeba is a multicellular organism.

Answer: False (Amoeba is unicellular).

5. Plasma membrane is present in all the cells.

Answer: True.

Review Questions (Page 17 – 18)

Very Short Answer Type Questions

1. What is plasma membrane?

Answer: The plasma membrane is a selectively permeable lipid bilayer that encloses the cell, controlling the movement of substances in and out.

2. Give the names of three basic molecules of the plasma membrane.

Answer: Phospholipids, Proteins, Cholesterol.

3. Mention the constituent of cell wall in bacteria & plants.

Answer: Bacteria: Peptidoglycan. Plants: Cellulose.

4. What is diffusion?

Answer: Diffusion is the passive movement of molecules from a region of higher concentration to a region of lower concentration.

5. Define osmosis.

Answer: Osmosis is the diffusion of water molecules across a selectively permeable membrane from a region of higher water concentration to lower water concentration.

6. What is active transport?

Answer: Active transport is the movement of substances across a cell membrane against their concentration gradient using energy (usually ATP).

7. Is the plant cell wall living or dead?

Answer: Dead (composed of cellulose, a non-living material).

8. What will happen if a few drops of ink are added to pure water?

Answer: The ink molecules will diffuse, spreading evenly throughout the water due to random molecular movement.

9. What will happen to plant cell when placed in concentrated sugar solution?

Answer: The plant cell will undergo plasmolysis; water moves out due to osmosis, causing the cell to shrink.

10. What will happen to raisins when placed in pure water?

Answer: Raisins will swell due to water entering the cells by osmosis (endosmosis).

Short Answer Type Questions

1. Mention the functions of plasma membrane.

Answer: Regulates entry and exit of substances (selectively permeable). Protects cell contents. Facilitates communication and signalling. Maintains cell shape and structure.

2. Describe the type of solutions on the basis of concentration.

Answer:

Isotonic: Same concentration as the cell; no net water movement.

Hypotonic: Lower solute concentration; water enters the cell.

Hypertonic: Higher solute concentration; water exits the cell.

3. Give difference between diffusion and osmosis.

Answer:

Feature	Diffusion	Osmosis
Definition	Movement of molecules from high to low concentration	Movement of water across a semi-permeable membrane
Medium	Occurs in any medium (solid, liquid, gas)	Occurs in liquid medium (water)
Membrane	May or may not require a membrane	Requires a selectively permeable membrane
Substances	Any molecule (e.g., gases, solutes)	Only water

4. Describe the structure of cell membrane.

Answer: The plasma membrane is a fluid mosaic model, consisting of: A phospholipid bilayer (hydrophilic heads, hydrophobic tails). Proteins (integral and peripheral) for transport and signaling. Cholesterol for stability and fluidity. Carbohydrates for cell recognition.

5. What is endocytosis? Mention its types.

Answer: Endocytosis is the process by which cells engulf large particles or substances by invaginating the plasma membrane.

Types:

Phagocytosis: Engulfing solid particles (cell eating).

Pinocytosis: Engulfing liquid particles (cell drinking).

Receptor-mediated endocytosis: Specific uptake via receptors.

Reasoning Type Questions

1. Why plasma membrane is called a selectively permeable membrane?

Answer: It allows only specific substances to pass through based on size, charge, or solubility, while restricting others, due to its phospholipid bilayer and protein channels.

2. Give the reason of liquid nature of plasma membrane.

Answer: The fluid nature is due to the phospholipid bilayer, where lipids and proteins can move laterally, and cholesterol maintains flexibility.

3. Why integral proteins cannot be separated easily from plasma membrane?

Answer: Integral proteins are embedded within the hydrophobic core of the phospholipid bilayer, making them tightly bound and difficult to extract without disrupting the membrane.

4. How cell identifies each other?

Answer: Cells identify each other through surface markers (glycoproteins and glycolipids) on the plasma membrane, which act as recognition signals.

5. Why cell wall allows entry of different sized molecules?

Answer: The cell wall is porous (not selectively permeable like the plasma membrane), allowing molecules of various sizes to pass through, depending on pore size.

Fill in the Blanks

1. Middle lamella is made up of **calcium pectate**.

2. In fungus, cell wall is made up of **chitin**.

3. The intaking of large-sized solid bio-molecules by plasma membrane is called **phagocytosis**.

4. Diffusion can occur in any medium, while osmosis occurs only in **aqueous** medium.

5. Movement of solutes or ions from **higher concentration** to **lower concentration** is called diffusion.

Teaching Task (Page 32 - 36)

Single Correct Answer Type

1. Answer: A. All living organisms are made up of cells.

Explanation: Cells are the basic structural units because all organisms are composed of cells.

2. Answer: A. Nerve cells.

Explanation: Nerve cells (neurons) can be up to a foot long in humans.

3. Answer: C. ATP.

Explanation: ATP is the energy currency of the cell.

4. Answer: C. Cell wall.

Explanation: The cell wall, made of cellulose, provides extra protection in plant cells.

5. Answer: A. Nucleus.

Explanation: The nucleus contains hereditary material (DNA).

6. Answer: A. Nucleus.

Explanation: DNA and RNA are primarily found in the nucleus.

7. Answer: B. Cell sap.

Explanation: Vacuoles are filled with cell sap in plant cells.

8. Answer: C. Cytology.

Explanation: Cytology is the study of cell structure and function.

9. Answer: B. Lysosomes.

Explanation: Lysosomes have a single membrane, unlike nucleus, chloroplast, and mitochondria.

10. Answer: B. Leucoplast.

Explanation: Leucoplasts store starch, oil, or proteins.

11. Answer: A. Cells → Tissues → Organs → Organ system → Organism.

Explanation: This is the correct hierarchy of organization.

12. Answer: B. They have their own DNA and ribosomes. **Explanation**: Mitochondria and chloroplasts are semi-autonomous due to their own genetic material.

13. Answer: B. DNA and Proteins.

Explanation: Chromosomes are composed of DNA and histone proteins.

14. Answer: B. Control what goes into and out of the cell.

Explanation: The plasma membrane regulates substance movement.

15. Answer: D. The structural and functional unit of life.

Explanation: Cells perform all life functions and form the organism's structure.

16. Answer: D. Lysosome.

Explanation: Lysosomes have a single membrane.

17. Answer: A. Plasma membrane.

Explanation: Animal cells lack a cell wall and are bounded by the plasma membrane.

18. Answer: C. ATP.

Explanation: Chloroplasts convert sunlight into chemical energy stored as ATP.

19. Answer: A. Osmosis.

Explanation: Root hairs absorb water via osmosis.

20. Answer: C. Cell wall.

Explanation: The cell wall is the outermost barrier in plant cells.

21. Answer: B. Cell wall.

Explanation: Plant cells have a cell wall, absent in animal cells.

22. Answer: A. Lysosome.

Explanation: Lysosomes break down waste (garbage disposer) and process nutrients (food processor).

23. Answer: A. Neuron.

Explanation: Neurons are the longest cells in the human body.

24. Answer: B. RBC.

Explanation: Mature red blood cells lack a nucleus.

25. Answer: C. ATP.

Explanation: ATP is the energy currency of the cell.

26. Answer: D. Chloroplast.

Explanation: Chloroplasts release oxygen during photosynthesis.

27. Answer: C. J.E. Purkinje.

Explanation: Purkinje coined the term "protoplasm."

28. Answer: C. Protein synthesis.

Explanation: Ribosomes are the site of protein synthesis.

29. Answer: D. Hydrolytic enzymes.

Explanation: Lysosomes contain hydrolytic enzymes for digestion.

30. Answer: A. Tonoplast.

Explanation: The tonoplast is the membrane surrounding the vacuole in plant cells.

More Than One Answer

31. Answer: B. ii, iii, iv.

Explanation: Unicellular organisms have one cell performing all functions (ii), examples include Amoeba, Bacteria, Paramecium (iii), and death of the cell causes organism death (iv). Statement i is incorrect (unicellular means one cell).

32. Answer: A. i, iii, iv.

Explanation: Ostrich egg is the largest cell (i), RBCs are among the smallest in the human body (iii), and bacteria like Mycoplasma are the smallest cells (iv). Neurons are long, not short (ii is incorrect).

33. Answer: A. i, ii, iii.

Explanation: Mitochondria have a double membrane (i is incorrect), ER is not the powerhouse (ii is incorrect), plastids are absent in animal cells (iii is incorrect). The nucleus is the controlling center (iv is correct).

Assertion & Reason

34. Answer: A. A & R true & R explains A.

Explanation: Mitochondria produce ATP, making them the powerhouse, and the reason explains this role.

35. Answer: C. A is true, R is false.

Explanation: Animal cells lack a cell wall (A is true), but they are covered by the plasma membrane, not just any cell membrane (R is slightly misleading but considered false in this context).

Match the Following

36. Answer: B. i-e, ii-d, iii-a, iv-b, v-c.

Explanation:

Unicellular: Paramecium (e).

Multicellular: Plants and animals (d).

Largest cell: Ostrich egg (a).

Living substance: Protoplasm (b).

Prokaryote: Blue-green algae (c).

37. Answer: B. 1-b, 2-c, 3-d, 4-a.

Explanation:

Mitochondria: Powerhouse (b).

Golgi bodies: Packaging unit (c).

Chloroplast: Food factory (d).

Lysosomes: Suicidal bags (a).

Comprehension

38. Answer: A. Flagellum.

Explanation: Prokaryotes use flagella for movement.

39. Answer: C. No membrane.

Explanation: Prokaryotic cells lack membrane-bound organelles.

40. Answer: B. Eukaryotes.

Explanation: Eukaryotes have a well-defined nucleus and organelles.

41. Answer: C. Bacteria & Blue-green algae.

Explanation: These are examples of prokaryotes.

Learner's Task (36 – 41)

Beginners (Level - I)

1. Answer: D. Chloroplasts.

Explanation: Chloroplasts perform photosynthesis, earning the title "kitchen of the cell."

2. Answer: A. Cell.

Explanation: The cell is the functional unit of life.

3. Answer: D. Matured man RBC.

Explanation: Mature human RBCs lack a nucleus.

4. Answer: A. Robert Hooke.

Explanation: Hooke coined the term "cell" in 1665.

5. Answer: D. Mitochondria.

Explanation: Mitochondria produce ATP, hence called the powerhouse.

6. Answer: C. Differentially permeable.

Explanation: The plasma membrane is selectively (differentially) permeable.

7. Answer: D. Cristae.

Explanation: Cristae are infoldings of the inner mitochondrial membrane.

8. Answer: A. Plasma membrane.

Explanation: The plasma membrane is the outermost boundary in animal cells.

9. Answer: A. Lysosomes.

Explanation: Lysosomes digest waste, acting as garbage disposals.

10. Answer: B. Cytoplasm.

Explanation: Cytoplasm is the jelly-like interior of the cell.

11. Answer: C. Ostrich.

Explanation: The ostrich egg is the largest cell.

12. Answer: C. 80.

Explanation: Cytoplasm contains about 80% water.

13. Answer: C. Spindle formation.

Explanation: Centrioles are involved in spindle formation during cell division.

14. Answer: C. Golgi apparatus.

Explanation: The Golgi apparatus is involved in secretion.

15. Answer: D. Starch grain.

Explanation: Starch grains are inclusions, not organelles.

16. Answer: B. Nucleus.

Explanation: The nucleus is not part of the cytoplasm.

17. Answer: A. Nucleus.

Explanation: The nucleus is the "brain" controlling cell activities.

18. Answer: C. Centrosome.

Explanation: The centrosome is not part of the nucleus.

19. Answer: A. DNA.

Explanation: Nucleus, chloroplast, and mitochondria all contain DNA.

20. Answer: B. Double and porous.

Explanation: The nuclear envelope is double-layered with pores.

21. Answer: C. Nuclear pores.

Explanation: Nuclear pores connect nucleoplasm to cytoplasm.

22. Answer: A. Fontana.

Explanation: Fontana discovered the nucleolus.

23. Answer: C. Synthesis of RNA and ribosomes.

Explanation: The nucleolus synthesizes RNA and ribosomes.

24. Answer: B. Pinocytosis.

Explanation: Pinocytosis is "cell drinking."

25. Answer: C. Peroxisome.

Explanation: Peroxisomes are involved in photorespiration.

26. Answer: A. Ribosomes.

Explanation: Rough ER contains ribosomes.

27. Answer: C. 2 subunits.

Explanation: Ribosomes have two subunits (large and small).

Achievers (Level - II)

1. Why are mitochondria called the powerhouse of the cell?

Answer: Mitochondria produce ATP through cellular respiration, providing energy for cell activities.

2. What name is given to the Golgi apparatus occurring in plant cells? Why is it named differently in plant cells?

Answer: In plant cells, the Golgi apparatus is called **dictyosomes**. It is named differently because it consists of separate, stacked units rather than a single continuous structure as in animal cells.

3. Why are lysosomes called scavengers?

Answer: Lysosomes contain hydrolytic enzymes that break down waste materials, dead organelles, and foreign particles, acting as scavengers to clean the cell.

4. What are suicide bags? Why are they called so?

Answer: Lysosomes are called suicide bags because they can release their hydrolytic enzymes to digest the cell's own contents during programmed cell death (autolysis).

5. What for ATP stands?

Answer: Adenosine Triphosphate.

6. What would happen if plasma membrane ruptures or breaks down?

Answer: The cell would lose its integrity, allowing uncontrolled entry/exit of substances, leading to cell damage or death.

7. Who discovered cells and how?

Answer: Robert Hooke discovered cells in 1665 by observing thin slices of cork under a microscope, noting box-like structures he called "cells."

8. Why is the plasma membrane called a selectively permeable membrane?

Answer: It selectively allows certain substances to pass through based on size, charge, or solubility, due to its phospholipid bilayer and protein channels.

9. Where are proteins synthesized inside the cell?

Answer: Proteins are synthesized on ribosomes, either free in the cytoplasm or attached to the rough endoplasmic reticulum.

10. How does a cell act as basic structural and functional unit of an organism?

Answer: Structurally, cells form tissues, organs, and systems. Functionally, they perform life processes like metabolism, reproduction, and response to stimuli through organelles like the nucleus, mitochondria, and ribosomes.

11. How is rough ER different from smooth ER? What functions do they perform in a cell?

Answer:

Rough ER: Studded with ribosomes; synthesizes and transports proteins.

Smooth ER: Lacks ribosomes; synthesizes lipids, detoxifies drugs, and regulates calcium ions.

12. What are different types of plastids? What are their functions?

Answer:

Chloroplasts: Contain chlorophyll; perform photosynthesis.

Chromoplasts: Contain pigments; impart color to flowers/fruits.

Leucoplasts: Store starch, oils, or proteins.

13. Describe the functions of Golgi complex.

Answer: Packages and modifies proteins and lipids. Forms lysosomes. Secretes substances like hormones and enzymes. Synthesizes carbohydrates for the cell wall in plants.

14. What would happen to the life of a cell if there was no Golgi apparatus?

Answer: The cell would fail to package, modify, or secrete proteins and lipids, impairing lysosome formation, secretion, and cell wall synthesis, leading to disrupted cell function and death.

15. Explain the structure of nucleus. What is its function?

Answer:

Structure: The nucleus is spherical, enclosed by a double-layered nuclear membrane with pores. It contains nucleoplasm, nucleolus (for ribosome synthesis), and chromatin (DNA and proteins).

Function: Controls cell activities, stores genetic material, and facilitates heredity and gene expression.

16. What is the main function of each of the following organelles:

Cell wall: Provides structural support and protection in plant cells.

Plasma membrane: Regulates entry and exit of substances.

Chromosomes: Carry genetic information for heredity.

Mitochondria: Produce ATP via cellular respiration.

Chloroplasts: Perform photosynthesis to produce food.

Golgi apparatus: Packages and modifies proteins/lipids for secretion.

Lysosomes: Digest waste materials and foreign particles.

Centrioles: Aid in cell division by forming spindle fibers.

Vacuoles: Store nutrients, waste, or maintain turgor pressure.

17. Distinguish between cell wall and cell membrane.

Answer:

Feature	**Cell Wall**	**Cell Membrane**
Location	Outermost in plant cells	Outermost in animal cells, inside cell wall in plants

Feature	Cell Wall	Cell Membrane
Composition	Cellulose (plants), peptidoglycan (bacteria)	Phospholipid bilayer with proteins
Nature	Non-living, rigid	Living, flexible
Permeability	Fully permeable	Selectively permeable
Function	Provides structure and protection	Regulates substance movement

18. Comment on the following:

(i) Chloroplast is called "Kitchen of the cell": Chloroplasts perform photosynthesis, producing food (glucose) for the cell, hence called the kitchen.

(ii) Chloroplast is semi-autonomous structure: Chloroplasts have their own DNA and ribosomes, allowing them to synthesize some proteins independently.

(iii) Lysosomes are garbage disposer: Lysosomes digest waste materials, dead organelles, and foreign particles, acting as the cell's garbage disposal system.

Explorers (Level - III)

More Than One Answer

1. Answer: C. i, ii, iv.

Explanation: The cell membrane is the plasma membrane (i), selectively controls substance movement (ii), and is made of lipids and proteins (iv). It does protect the cell's contents (iii is incorrect).

2. Answer: A. Only iii.

Explanation: Plastids have three types (i is correct), vacuoles are fluid-filled (ii is correct), ribosomes synthesize proteins (iv is correct). Cell walls are absent in animal cells (iii is incorrect).

3. Answer: B. iii, iv.

Explanation: Cell wall is non-living (iii), leucoplasts store starch (iv). Amoeba performs all functions (i is incorrect), and cell size doesn't correlate with organism size (ii is incorrect).

Assertion & Reason

4. Answer: A. A & R true & R explains A.

Explanation: Mitochondria and chloroplasts are semi-autonomous because they have their own DNA and ribosomes, enabling protein synthesis.

5. Answer: C. A is true, R is false.

Explanation: Plastids with chlorophyll are chloroplasts, not chromoplasts, which contain other pigments.

Match the Following

6. Answer: B. 1-d, 2-a, 3-b, 4-c.

Explanation:

Cytoplasm: Center for metabolic activities (d).

Mitochondria: Produce ATP (a).

RER: Synthesizes proteins (b).

Golgi apparatus: Synthesizes and secretes enzymes/hormones (c).

7. Answer: A. 1-d, 2-a, 3-b, 4-c.

Explanation:

Chromoplast: Imparts colours (d).

Leucoplast: Stores starch (a).

Chloroplast: Photosynthesis (b).

Plastids: Have double membrane (c).

Comprehension

8. Answer: A. Nucleoplasm.

Explanation: Nucleoplasm is the fluid inside the nucleus.

9. Answer: B. Thread-like.

Explanation: Chromatin appears thread-like in the nucleus.

10. Answer: C. Deoxyribonucleic Acid.

Explanation: DNA stands for Deoxyribonucleic Acid.

11. Answer: D. Both A & C.

Explanation: The nucleus is called the brain and boss of the cell due to its control over cell activities.