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Biology Grade 11 — Chapter 1

Cells and Sub-Cellular Organelles

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Independent practice MCQs from the supplied Class 11 Biology notes pack. Total: 50 questions.

A. Important / Main Topics

1. Which of the following is the basic structural and functional unit of all living organisms?

(A) Cell
(B) Tissue
(C) Organ
(D) Organelle

Correct Answer: A

Explanation: The notes state that a cell is defined as the structural and functional unit of living organisms and is the basic structural unit of all unicellular and multicellular organisms.

2. According to the cell theory, where do new cells come from?

(A) Spontaneous generation from non-living matter
(B) Pre-existing cells through cellular division
(C) The nucleus of older cells
(D) The extracellular matrix

Correct Answer: B

Explanation: Rudolf Virchow (1855) observed that new cells develop by the division of pre-existing cells, which became the third statement of the cell theory.

3. Which scientist observed that animal cells lack a cell wall but are covered by a membrane?

(A) Robert Hooke
(B) Schleiden
(C) Schwann
(D) Rudolf Virchow

Correct Answer: C

Explanation: Schwann, a German zoologist, studied animal cells and found that they lack a cell wall and are covered by a membrane, recognizing that the inside of plant and animal cells is identical apart from the cell wall.

4. What is the technique used to view objects that cannot be seen by the naked eye called?

(A) Microbiology
(B) Histology
(C) Cytology
(D) Microscopy

Correct Answer: D

Explanation: The notes define microscopy as the technique used to view objects that cannot be seen by the naked eye.

5. What is the maximum magnification of a light microscope?

(A) 1500X
(B) 100X
(C) 400X
(D) 50 million times

Correct Answer: A

Explanation: The maximum magnification of a light microscope is 1500X, achieved using a 100X objective and a 15X ocular lens.

6. What is the fine structure of the cell as seen with the electron microscope known as?

(A) Cytoplasm
(B) Ultrastructure
(C) Protoplasm
(D) Nucleoplasm

Correct Answer: B

Explanation: The notes define ultrastructure as the fine structure of the cell as seen with the electron microscope.

7. Which of the following is the outer living boundary of a cell?

(A) Cell wall
(B) Capsule
(C) Plasma membrane
(D) Glycocalyx

Correct Answer: C

Explanation: The plasma membrane is the outer living boundary of the cell and is found in all living prokaryotic and eukaryotic cells.

8. Which chemical is the primary component of the plant cell wall?

(A) Chitin
(B) Peptidoglycan
(C) Lignin
(D) Cellulose

Correct Answer: D

Explanation: The notes state that plant cell walls are made up of cellulose, which differs in chemical composition from prokaryotic (peptidoglycan) and fungal (chitin) cell walls.

9. What is the region between the nuclear membrane and the plasma membrane called?

(A) Cytoplasm
(B) Protoplasm
(C) Nucleoplasm
(D) Nucleoid

Correct Answer: A

Explanation: The notes state that cytoplasm is the region between the nuclear membrane and the plasma membrane and is a common component of both prokaryotic and eukaryotic cells.

10. What is the process by which cells communicate with other cells called?

(A) Cell division
(B) Cell signaling
(C) Cell respiration
(D) Cell transport

Correct Answer: B

Explanation: The notes define cell signaling as the process by which cells communicate with other cells within their body or with the external environment.

11. Which type of transport requires the help of transport proteins but does not require energy?

(A) Simple diffusion
(B) Active transport
(C) Facilitated diffusion
(D) Endocytosis

Correct Answer: C

Explanation: Facilitated diffusion is a type of passive transport where molecules move from higher to lower concentration with the help of transport proteins (channel or carrier proteins).

12. What are the two main types of cells based on structural organization?

(A) Plant cells and animal cells
(B) Unicellular and multicellular cells
(C) Somatic and germ cells

(D) Prokaryotic cells and eukaryotic cells

Correct Answer: D

Explanation: The notes state that two kinds of structurally different cells have evolved over time: prokaryotic cells and eukaryotic cells.

13. What is a cell with the unique ability to develop into specialized cell types in the body called?

(A) Stem cell
(B) Zygote
(C) Somatic cell
(D) Germ cell

Correct Answer: A

Explanation: A stem cell is defined as a cell with the unique ability to develop into specialized cell types in the body.

14. Which process allows large molecules, bacteria, and waste materials to cross the cell membrane by engulfing or releasing them in vesicles?

(A) Diffusion and osmosis
(B) Endocytosis and exocytosis
(C) Active transport
(D) Facilitated diffusion

Correct Answer: B

Explanation: Exocytosis and endocytosis are processes that allow large molecules, bacteria, and waste materials that cannot diffuse through the lipid bilayer to cross the cell membrane.

15. Which type of cell division is used for the growth and repair of somatic cells?

(A) Meiosis
(B) Binary fission
(C) Mitosis
(D) Budding

Correct Answer: C

Explanation: The notes state that somatic cells divide by mitosis, whereas germ line cells divide by meiosis.

16. A student observes a cell under a microscope and notices that it has a cell wall, chloroplasts, and a large central vacuole. To which type of organism does this cell most likely belong?

(A) Animal
(B) Fungus
(C) Bacterium
(D) Plant

Correct Answer: D

Explanation: Plant cells are characterized by the presence of a cell wall (cellulose), chloroplasts, and a large central vacuole, distinguishing them from animal cells.

17. Which of the following experimental evidences validates the cell theory by disproving spontaneous generation?

(A) Experiments by Francesco Redi and Louis Pasteur showed cells cannot grow in sealed, sterile conditions.
(B) Cells removed from tissues can survive independently.
(C) Nothing smaller than a cell can live independently.
(D) Cells arise from pre-existing cells through cellular division.

Correct Answer: A

Explanation: Redi and Pasteur demonstrated that cells cannot grow in sealed and sterile conditions, validating the cell theory by disproving spontaneous generation.

18. Why does an electron microscope have a much higher resolving power than a light microscope?

(A) It uses more lenses.
(B) It uses electron beams with a much shorter wavelength.
(C) It uses a higher intensity of light.
(D) It uses thicker specimens.

Correct Answer: B

Explanation: It uses electron beams with a much shorter wavelength. — this correctly answers the question.

19. Which part of the plasma membrane is responsible for controlling the fluidity of the membrane?

(A) Proteins
(B) Carbohydrates
(C) Lipids
(D) Cytoskeleton

Correct Answer: C

Explanation: The notes state that the lipid part of the plasma membrane controls the fluidity of the membrane. Higher concentrations of unsaturated fatty acids increase fluidity, while cholesterol stabilizes the bilayer.

20. A protein hormone cannot pass through the plasma membrane. Which of the following correctly describes its signaling pathway?

(A) It binds to an intracellular receptor and directly affects gene expression.
(B) It diffuses through the membrane and acts as a transcription factor.
(C) It enters the nucleus through nuclear pores and activates genes.
(D) It binds to a cell surface receptor, generating a second messenger like cAMP.

Correct Answer: D

Explanation: Protein and peptide hormones are water-soluble and cannot pass through the plasma membrane. They bind to receptors on the cell surface, initiating a signal transduction pathway that generates a second messenger, such as cAMP.

21. Which mechanism of membrane transport is responsible for the movement of water molecules across a semipermeable membrane from a region of low solute concentration to high solute concentration?

(A) Osmosis
(B) Simple diffusion
(C) Facilitated diffusion
(D) Active transport

Correct Answer: A

Explanation: Osmosis is the process by which molecules (water) pass from a solution of low concentration to a solution of high concentration through a semipermeable membrane.

22. Which organelle is known as the "suicidal bag" of the cell because it can digest the cell's own components during autolysis?

(A) Peroxisome
(B) Lysosome
(C) Golgi apparatus
(D) Vacuole

Correct Answer: B

Explanation: Lysosomes are called suicidal bags because during autolysis (programmed cell death), they burst and release their enzymes to disintegrate the cell.

23. What is the primary function of the smooth endoplasmic reticulum (SER)?

(A) Protein synthesis
(B) Carbohydrate synthesis
(C) Lipid synthesis and detoxification
(D) ATP production

Correct Answer: C

Explanation: Lipid synthesis and detoxification — this correctly answers the question.

24. Which of the following statements correctly describes the arrangement of phospholipids in the plasma membrane?

(A) Hydrophilic tails face each other, and hydrophobic heads face outward.
(B) Both heads and tails face outward.

(C) Both heads and tails face inward.
(D) Hydrophobic tails face each other, and hydrophilic heads face outward.

Correct Answer: D

Explanation: The fluid mosaic model describes the phospholipid bilayer with hydrophobic ends facing each other (inward) and hydrophilic ends on the surface (outward).

25. How do prokaryotic ribosomes differ from eukaryotic ribosomes?

(A) Prokaryotic ribosomes are 70S with 30S and 50S subunits; eukaryotic are 80S with 40S and 60S subunits.
(B) Prokaryotic ribosomes are 80S; eukaryotic are 70S.
(C) Both are 70S.
(D) Prokaryotic ribosomes lack RNA.

Correct Answer: A

Explanation: The notes state prokaryotic ribosomes are 70S (30S + 50S) and eukaryotic are 80S (40S + 60S).

B. Less Important / Secondary Topics

26. A cell is placed in a hypotonic solution. What will happen to an animal cell?

(A) It will swell and may burst due to water entering.
(B) It will shrink due to water loss.
(C) It will remain unchanged.
(D) It will actively pump out water.

Correct Answer: A

Explanation: In a hypotonic solution, water enters the cell by osmosis. Animal cells lack a cell wall, so they may swell and burst.

27. Which organelle is responsible for modifying, sorting, and packaging proteins and lipids?

(A) Ribosome
(B) Golgi apparatus
(C) Lysosome
(D) Peroxisome

Correct Answer: B

Explanation: The Golgi complex processes cell secretions, modifies proteins from the RER, and packages them into vesicles for transport.

28. What is the function of the nucleolus?

(A) Synthesizes DNA
(B) Produces ATP
(C) Constructs ribosomes
(D) Modifies proteins

Correct Answer: C

Explanation: The nucleolus is involved in the construction of ribosomes. It contains granular and fibrillar areas with rRNA and rDNA.

29. Which part of the chloroplast is the site of the light-dependent reactions of photosynthesis?

(A) Stroma
(B) Outer membrane
(C) Intermembrane space
(D) Grana (thylakoids)

Correct Answer: D

Explanation: The light-dependent reaction takes place in the grana region of the chloroplast, where photosynthetic pigments are located on the thylakoid membranes.

30. During which phase of the cell cycle are chromosomes duplicated?

(A) S phase
(B) G□ phase

(C) G□ phase
(D) M phase

Correct Answer: A

Explanation: Chromosomes are duplicated only during the S (synthesis) phase of interphase.

31. A cell that has a single circular chromosome and divides by binary fission is most likely a:

(A) Plant cell
(B) Prokaryotic cell
(C) Animal cell
(D) Fungal cell

Correct Answer: B

Explanation: A cell that has a single circular chromosome and divides by binary fission is most likely a Prokaryotic cell.

32. What is the primary function of the electron transport chain in mitochondria?

(A) Glycolysis
(B) Krebs cycle
(C) ATP production via oxidative phosphorylation
(D) Protein synthesis

Correct Answer: C

Explanation: The inner mitochondrial membrane contains the electron transport chain and ATP synthase (FO-F1 particles), which generate ATP via oxidative phosphorylation.

33. Which type of stem cells can differentiate into all possible cell types, including the placenta?

(A) Pluripotent
(B) Multipotent
(C) Unipotent
(D) Totipotent

Correct Answer: D

Explanation: Totipotent stem cells can differentiate into all possible cell types. The first few cells that appear as the zygote starts to divide are totipotent.

34. In cystic fibrosis, a defective chloride channel protein causes the disease. Which function of membrane proteins is primarily affected?

(A) Transport
(B) Enzymatic activity
(C) Cell-cell recognition
(D) Signal transduction

Correct Answer: A

Explanation: The defective protein in cystic fibrosis is a chloride channel, which is involved in the transport of chloride ions across the membrane.

35. Which of the following is a function of the cytoskeleton in a eukaryotic cell?

(A) Synthesizing proteins
(B) Providing structural support and maintaining cell shape
(C) Producing ATP
(D) Storing genetic information

Correct Answer: B

Explanation: Providing structural support and maintaining cell shape — this correctly answers the question.

36. A researcher treats a cell with a drug that inhibits microtubule formation. Which process would be most directly affected?

(A) Protein synthesis
(B) DNA replication
(C) Mitotic spindle formation during cell division
(D) ATP synthesis

Correct Answer: C

Explanation: Microtubules are the main components of the mitotic spindle, which is required for chromosome separation during cell division.

37. If the concentration of unsaturated fatty acids in the phospholipids of a plasma membrane increases, what is the most likely consequence?

(A) The membrane becomes less fluid and more rigid.
(B) The membrane becomes impermeable to all substances.
(C) The membrane loses its protein components.
(D) The membrane becomes more fluid and flexible.

Correct Answer: D

Explanation: The notes state that when the concentration of unsaturated fatty acids in phospholipids increases, the bilayer becomes more fluid, making the cell membrane more flexible.

38. A plant cell is placed in a hypertonic solution. What will happen to the cell?

(A) It will lose water and undergo plasmolysis.
(B) It will swell and burst.
(C) It will become turgid.
(D) It will actively pump in water.

Correct Answer: A

Explanation: In a hypertonic solution, water leaves the cell by osmosis. The protoplast shrinks away from the cell wall, a process called plasmolysis.

39. Which structural difference between prokaryotic and eukaryotic cells has the greatest impact on the speed of gene expression (transcription and translation)?

(A) Prokaryotes have 80S ribosomes, making translation faster.
(B) Prokaryotes lack a nuclear envelope, allowing transcription and translation to occur simultaneously.
(C) Eukaryotes have a single circular chromosome, which speeds up transcription.
(D) Prokaryotes have linear DNA, which is easier to transcribe.

Correct Answer: B

Explanation: Prokaryotes lack a nuclear envelope, allowing transcription and translation to occur simultaneously. — this correctly answers the question.

40. A mutation in a gene results in the production of a protein that lacks a signal peptide. Which organelle would be unable to process this protein?

(A) Ribosome
(B) Smooth Endoplasmic Reticulum
(C) Rough Endoplasmic Reticulum
(D) Mitochondrion

Correct Answer: C

Explanation: Signal peptides are required for proteins to be directed to the rough ER. Without a signal peptide, the protein cannot enter the RER for processing.

41. If a cell's lysosomes were unable to fuse with autophagosomes, what would be the most likely consequence?

(A) The cell would be unable to synthesize proteins.
(B) The cell would divide uncontrollably.
(C) The cell would be unable to produce ATP.
(D) Damaged organelles and cellular waste would accumulate in the cell.

Correct Answer: D

Explanation: Damaged organelles and cellular waste would accumulate in the cell. — this correctly answers the question.

42. Which statement best explains why the fluid mosaic model describes the membrane as "mosaic"?

(A) Proteins are scattered throughout the lipid bilayer in an irregular pattern.
(B) The membrane is rigid and static.

(C) Lipids are distributed evenly and symmetrically.
(D) The membrane is composed of only one type of molecule.

Correct Answer: A

Explanation: The fluid mosaic model describes the membrane as a mosaic because proteins are scattered throughout the lipid bilayer in an irregular pattern, like tiles in a mosaic.

43. During an experiment, a cell is treated with a chemical that prevents the hydrolysis of ATP. Which process would be most directly inhibited?

(A) Simple diffusion
(B) Active transport
(C) Facilitated diffusion
(D) Osmosis

Correct Answer: B

Explanation: Active transport — this correctly answers the question.

44. A cell has a high concentration of Na outside and a high concentration of K inside. Which mechanism is responsible for maintaining these concentration gradients?

(A) Simple diffusion
(B) Osmosis
(C) The sodium-potassium pump (active transport)
(D) Facilitated diffusion

Correct Answer: C

Explanation: The sodium-potassium pump (active transport) — this correctly answers the question.

45. In an experiment, a plant cell is immersed in a solution with a water potential equal to that of the cell's cytoplasm. What is the expected result?

(A) The cell will swell and burst.
(B) The cell will shrink and plasmolyze.
(C) The cell will actively pump out water.
(D) There will be no net movement of water.

Correct Answer: D

Explanation: When the water potential of the external solution equals the water potential of the cell, there is no net movement of water across the membrane.

46. If a cell is treated with a drug that blocks the function of the Golgi apparatus, which of the following would be most directly affected?

(A) Packaging and secretion of proteins
(B) Synthesis of ATP
(C) DNA replication
(D) Breakdown of hydrogen peroxide

Correct Answer: A

Explanation: The Golgi apparatus is responsible for modifying, sorting, and packaging proteins and lipids for secretion or delivery to other organelles.

47. Which of the following observations provides the strongest evidence that mitochondria and chloroplasts were once free-living prokaryotes?

(A) They are present in all eukaryotic cells.
(B) They contain their own circular DNA and 70S ribosomes.
(C) They are surrounded by a single membrane.
(D) They are produced by the Golgi apparatus.

Correct Answer: B

Explanation: They contain their own circular DNA and 70S ribosomes. — this correctly answers the question.

48. A cell is treated with a chemical that disrupts the nuclear pores. What process would be most directly blocked?

(A) Replication of DNA within the nucleus

(B) Transcription of DNA into mRNA within the nucleus
(C) Transport of mRNA from the nucleus to the cytoplasm
(D) Synthesis of ribosomal proteins in the cytoplasm

Correct Answer: C

Explanation: Nuclear pores regulate the nucleo-cytoplasmic exchange. Disruption would block the transport of mRNA from the nucleus to the cytoplasm.

49. In which of the following scenarios would a cell be most likely to undergo apoptosis (programmed cell death)?

(A) When the cell is actively dividing to repair tissue.
(B) When a cell is infected by a virus and is producing viral proteins.
(C) When a cell is exposed to a mitogen.
(D) During normal development, when specific cells are no longer needed.

Correct Answer: D

Explanation: Apoptosis is a programmed cell death that occurs during developmental phases when specific cells are required to be disintegrated (e.g., tadpole tail resorption).

50. A researcher observes that a particular cell has a high number of mitochondria and extensive rough ER. Which of the following is the most likely function of this cell?

(A) Rapid protein synthesis and high energy demand
(B) Storage of lipids
(C) Photosynthesis
(D) DNA replication without cell division

Correct Answer: A

Explanation: A cell with a high number of mitochondria has a high energy demand, and extensive rough ER indicates active protein synthesis (e.g., a secretory cell).