2. CELL - THE FUNDAMENTAL (Solutions)

TEACHING TASK (Page 27 – 30)

Multiple Choice Questions (Single Correct Answer)

1) Cell theory is proposed by
Answer: C. Schleiden and Schwann
Solution: Matthias Schleiden and Theodor Schwann proposed the cell theory in 1838–1839, stating that all living organisms are composed of cells.

2) In bacteria, some of the functions of eukaryotic cells are performed by
Answer: C. The membrane
Solution: In bacteria (prokaryotes), the plasma membrane performs functions like respiration and transport, which in eukaryotic cells are handled by organelles like mitochondria.

3) The animal cell which does not possess nucleus is
Answer: C. Red blood cell
Solution: Mature red blood cells in mammals lack a nucleus to maximize space for hemoglobin, unlike other cells listed.

4) The cells with no membrane-bound organelles, and the chromosomes are composed of only nucleic acids are
Answer: C. Prokaryotic cell
Solution: Prokaryotic cells lack membrane-bound organelles and have chromosomes composed solely of DNA, without histone proteins typical of eukaryotic cells.

5) The rough ER is so named because it has an abundance of
Answer: D. Ribosomes
Solution: The rough endoplasmic reticulum (ER) is studded with ribosomes, giving it a "rough" appearance and enabling protein synthesis.

6) The organelle that helps in membrane biogenesis is
Answer: C. Endoplasmic Reticulum
Solution: The endoplasmic reticulum, especially the smooth ER, synthesizes lipids and proteins for membrane formation, contributing to membrane biogenesis.

7) The rough ER is specially well developed in cells actively engaged in
Answer: A. Protein
Solution: The rough ER, with its ribosomes, is highly developed in cells like pancreatic cells that actively synthesize proteins for secretion.

8) Which of the following structures is usually present only in animal cells?
Answer: D. Centrioles
Solution: Centrioles, involved in cell division, are typically found only in animal cells, unlike vacuoles (common in plants), cell walls (plant-specific), or nuclei (in both).

9) Stroma and Grana are portions of
Answer: A. Chloroplast
Solution: Stroma (fluid matrix) and grana (stacks of thylakoids) are structural components of chloroplasts, where photosynthesis occurs.

10) Within chloroplast, light is captured by
Answer: A. Thylakoids within grana
Solution: Thylakoids, located within grana, contain chlorophyll, which captures light for photosynthesis.

11) Besides nucleus, DNA is also present in
Answer: B. Mitochondria
Solution: Mitochondria contain their own DNA (mtDNA), used for synthesizing some mitochondrial proteins, unlike the other organelles listed.

12) The inner membrane of mitochondria is folded because
Answer: C. It increases the surface area
Solution: The inner membrane's folds (cristae) increase surface area for ATP production during cellular respiration.

13) Kitchen of the cell is
Answer: C. Chloroplast
Solution: Chloroplasts are called the "kitchen of the cell" in plant cells because they produce energy-rich compounds via photosynthesis.

14) Ribosomes are made up of subunits
Answer: B. 2
Solution: Ribosomes consist of two subunits (large and small), which assemble to facilitate protein synthesis.

15) The single membrane cell organelle is
Answer: D. Sphaerosome
Solution: Sphaerosomes are single-membrane organelles involved in lipid storage, unlike plastids and mitochondria (double-membrane) or ribosomes (no membrane).

16) Who is so called Father of Microscopy
Answer: C. Leeuwenhoek
Solution: Antonie van Leeuwenhoek is considered the "Father of Microscopy" for his pioneering work in developing and using microscopes to observe microorganisms.

Advanced Questions

More Than One Answer

17) Which of these options are not a function of ribosomes?
Answer: C. (iii) and (iv)
Solution: Ribosomes synthesize proteins (i) and enzymes (ii, as enzymes are proteins). They do not synthesize hormones (iii) or starch (iv), which are produced by other cellular processes.

18) Components of cytoskeleton are
Answer: D. All

Solution: The cytoskeleton includes microtubules, microfilaments, and intermediate filaments, all of which provide structural support and enable cell movement.

Assertion & Reason

19) A: A cell membrane shows fluid behaviour. R: A membrane is a mosaic of lipids and proteins.
Answer: A. A & R are true & R explains A
Solution: The cell membrane's fluid behavior is due to its fluid mosaic structure, where lipids and proteins move laterally, explaining its flexibility.

20) A: Cell wall is a non-living part of the cell. R: It offers protection, shape, and transport of materials.
Answer: A. A & R are true & R explains A
Solution: The cell wall is non-living and provides protection, shape, and facilitates material transport (e.g., in plants), supporting the assertion.

21) A: Primitive microscope is also called simple microscope. R: Its magnification power was 14-42 times.
Answer: B. A & R are true but R doesn't explain A
Solution: A primitive microscope is indeed a simple microscope (A is true), and early microscopes had limited magnification (R is true), but the magnification range doesn't explain why it's called a simple microscope.

Match the Following

21) Match the organelles with their descriptions:
Answer: A. 1-c, 2-d, 3-a, 4-b
Solution:

Smooth endoplasmic reticulum → c. Detoxification (synthesizes lipids, detoxifies substances)

Lysosome → d. Suicidal bag (contains digestive enzymes)

Food vacuoles → a. Amoeba (used for digestion in amoebas)

Chromatin material → b. Nucleus (contains DNA in the nucleus)

22) Match the structures with their descriptions:
Answer: D. 1-b, 2-d, 3-a, 4-c
Solution:

Cristae → b. Infolding in mitochondria (folds for ATP production)

Cisternae → d. Disc-shaped sacs in Golgi apparatus (stacked membranes)

Thylakoids → a. Flat membrane sacs in stroma (photosynthetic membranes in chloroplasts)

Matrix → c. Colourless fluid (mitochondrial matrix contains enzymes)

Comprehension

Paragraph-based questions on eukaryotic cell organelles:

23) What is the main distinctive feature of prokaryotic and eukaryotic cells?
Answer: A. Nucleus
Solution: The presence of a true nucleus (membrane-bound) is the primary distinction between eukaryotic (nucleus present) and prokaryotic (no nucleus) cells.

24) Cell organelles of eukaryotic cell belong to
Answer: A. Endomembrane system
Solution: Many eukaryotic organelles (e.g., ER, Golgi, lysosomes) are part of the endomembrane system, as described in the passage.

25) Which of the following does not communicate with organelles of endomembrane system?
Answer: C. Both A & B
Solution: Mitochondria (A) and peroxisomes (B) do not communicate with the endomembrane system, as stated in the passage.

26) Which of the cell organelle is called store house of cell?
Answer: A. Vacuole
Solution: Vacuoles store nutrients, waste, and other substances, earning them the title "storehouse of the cell."

LEARNER'S TASK (Page 30 – 33)

Multiple Choice Questions (Single Correct Answer)

1) Study of cell is called
Answer: A. Cytology
Solution: Cytology is the branch of biology that studies cells, their structure, and functions.

2) The first compound microscope was prepared by
Answer: D. None
Solution: The first compound microscope was developed by Hans and Zacharias Janssen, not listed among the options.

3) Ribosomes are found
Answer: D. Both B & C
Solution: Ribosomes are found in the cytoplasm (B) and in both prokaryotic and eukaryotic cells (C).

4) Mechanical support to the cell is provided by
Answer: None (Correct answer not listed)
Solution: The cytoskeleton provides mechanical support, but it's not an option. None of the listed options (Golgi, protein/starch, chitin/starch, nucleotides/amino acids) accurately fit.

5) The part of the cell responsible for maintaining cell shape, internal organization, and cell movement is the
Answer: D. Cytoskeleton
Solution: The cytoskeleton, composed of microtubules, microfilaments, and intermediate filaments, maintains cell shape, organization, and movement.

6) Cell wall is present in
Answer: D. All of these
Solution: Plant cells, prokaryotic cells (e.g., bacteria), and algal cells all have cell walls.

7) Animal cell is limited by
Answer: A. Plasma membrane
Solution: Animal cells lack a cell wall and are bounded by the plasma membrane.

8) Chromosomes are made up of
Answer: C. DNA and Protein
Solution: Chromosomes consist of DNA wrapped around histone proteins in eukaryotic cells.

9) The network of Endoplasmic reticulum is present in the
Answer: C. Cytoplasm
Solution: The endoplasmic reticulum is a network of membranes located in the cytoplasm.

10) Lysosomes are made up of
Answer: A. One membrane
Solution: Lysosomes are single-membrane-bound organelles containing digestive enzymes.

11) Golgi Complex was discovered by
Answer: A. Camillo Golgi
Solution: Camillo Golgi discovered the Golgi complex, named after him, in 1898.

12) The part of the cell responsible for maintaining cell shape, internal organization, and cell movement is the
Answer: D. Cytoskeleton
Solution: Repeated question; the cytoskeleton is responsible for these functions.

13) Chemically cytoplasm contains about ___ % of water
Answer: A. 90%
Solution: Cytoplasm is approximately 90% water, serving as the medium for cellular processes.

14) Another name for mitochondria is
Answer: B. Semi-autonomous organelles
Solution: Mitochondria are called semi-autonomous because they have their own DNA and can replicate independently.

15) Main difference between animal cell and plant cell is
Answer: None (Correct answer not listed)
Solution: The main difference is the presence of a cell wall, chloroplasts, and large vacuoles in plant cells, but none of the options (nutrition, growth, movement, respiration) accurately reflect this.

16) This component of cell helps in intercellular transport
Answer: A. Microtubules
Solution: Microtubules, part of the cytoskeleton, facilitate intracellular transport (e.g., via motor proteins).

Descriptive Questions

1) Cell inclusions are
Answer: a) Non-living materials present in the cytoplasm
Solution: Cell inclusions are non-living substances (e.g., starch grains, oil droplets) stored in the cytoplasm, not organelles, cytoskeleton, or a link between cell wall and membrane.

2) What will happen if
a) Excess amount of fertilizer is added to a green lawn?
Solution: Excess fertilizer increases soil salinity, causing water to move out of plant cells via osmosis, leading to plasmolysis, wilting, or death of grass.
b) Salt is added to cut pieces of raw mango?
Solution: Salt draws water out of mango cells due to osmosis (high salt concentration outside), causing the pieces to shrivel and preserve them.

3) What will happen if chloroplast is taken out of the cell and illuminated?
Solution: An isolated chloroplast may still perform photosynthesis if provided with necessary cofactors (e.g., water, CO_2, and light). Thylakoids

can capture light and produce oxygen and ATP, but the process would be limited without the cell's metabolic support.

4) What would happen if plasma membrane ruptures?
Solution: If the plasma membrane ruptures, the cell loses its integrity, allowing cytoplasm to leak out and external substances to enter, leading to cell death.

5) What would happen if the plasma membrane ruptures or breaks down?
Solution: Repeated question; rupture causes loss of cell contents, disrupts homeostasis, and results in cell lysis or death.

Advanced Questions

More Than One Answer

1) Find out the incorrect statement.
Answer: B. Both (ii) & (iii) is incorrect
Solution:

(i) Osmosis is correct (slow, down concentration gradient, no energy).

(ii) Incorrect: Electron microscopes use electromagnets and electron beams, but not "very high voltage electricity" as a defining feature.

(iii) Incorrect: A semipermeable membrane allows solvent (not solute) to pass.

(iv) Active transport is correct (rapid, against gradient, uses ATP).

2) Find out the false statement
Answer: None (Correct answer: (iii) is false)
Solution:

(i) True: Nucleus, plastids, and mitochondria have DNA and make proteins.

(ii) True: Mitochondria are the powerhouse.

(iii) False: Lysosomes are not chlorophyll-containing; chloroplasts are.

(iv) True: Ribosomes are protein factories.
Note: None of the options correctly identify (iii) as false, suggesting a possible error in options.

3) Select the odd one out.
Answer: B. (iv)
Solution:

(i), (ii), (iii) describe properties of membranes (osmosis, composition, solubility).

(iv) is incorrect: Plant plasma membranes do not contain chitin (cell walls do), making it the odd one out.

4) Which of these is not related to Endoplasmic Reticulum?
Answer: C. (iii)
Solution:

(i), (ii), (iv) are true: ER is a membranous network, connected to the plasma membrane and nuclear envelope, and exists as vesicles/tubules.

(iii) is true but not directly related to ER's definition; ER absence in prokaryotes/RBCs is a fact but not a core characteristic of ER.

Assertion & Reason

5) A: Multicellular organisms have higher survival value than unicellular organisms. R: Dead cells are replaced by new cells in multicellular organisms.
Answer: A. A & R are true & R explains A
Solution: Multicellular organisms have higher survival due to cell replacement (e.g., tissue repair), which explains their resilience.

6) A: Plasma membrane is selectively permeable. R: Plasma membrane allows some molecules to pass through more easily than others.
Answer: A. A & R are true & R explains A
Solution: Selective permeability means the membrane allows certain molecules (e.g., small, non-polar) to pass more easily, as explained by the reason.

7) A: ER acts as a circulatory system. R: ER functions as cytoskeleton.
Answer: C. A is true, R is false
Solution: The ER facilitates intracellular transport (like a circulatory system), but it does not function as the cytoskeleton, which provides structural support.

8) A: Mitochondria are known as 'Power House' of cell. R: Mitochondria are used to bring about energy-requiring activities of the cell.
Answer: A. A & R are true & R explains A
Solution: Mitochondria produce ATP, powering cellular activities, which explains their "powerhouse" role.

9) A: Mitochondria are able to make some of their own proteins. R: They are known as semi-autonomous organelles.
Answer: A. A & R are true & R explains A
Solution: Mitochondria synthesize some proteins using their own DNA, justifying their semi-autonomous status.

Match the Following

10) Match the organelles with their functions:
Answer: A. 1-c, 2-d, 3-a, 4-b
Solution:

Endoplasmic reticulum → c. Synthesis of lipids (smooth ER)

Free ribosomes → d. Synthesis of secretory proteins

Mitochondria → a. Cellular respiration (ATP production)

Contractile vacuole → b. Osmoregulation (e.g., in protists like Amoeba)

11) Match the organelles with their descriptions:
Answer: A. 1-b, 2-a, 3-d, 4-c
Solution:

Nucleus → b. Cell brain (controls cell activities)

Mitochondria → a. Powerhouse (ATP production)

Lysosomes → d. Suicidal bags (digestive enzymes)

Cell membrane → c. Plasma membrane (cell boundary)

Comprehension

Paragraph-based questions on the nucleus:

12) i) Which is called Director or Master of cell?
Answer: Nucleus
Solution: The nucleus controls cellular activities via gene expression, earning it the title "director" or "master."

ii) Which part of nucleus is called Factory of Ribosomes?
Answer: Nucleolus
Solution: The nucleolus, within the nucleus, is the site of ribosome synthesis.

iii) Which part of the cell synthesizes proteins?
Answer: Ribosomes
Solution: Although the passage mentions the nucleolus as the site of ribosome formation, ribosomes (in the cytoplasm or on rough ER) synthesize proteins.

iv) What is the full form of DNA and Structure of DNA?
Answer: Deoxyribonucleic Acid; double-stranded helix
Solution: DNA stands for Deoxyribonucleic Acid, and its structure is a double-stranded helix, as implied by the chromatin's genetic material.

v) Which part of nucleus is the genetic transmitter?
Answer: Chromosomes (genes)
Solution: Chromosomes, composed of DNA and containing genes, transmit genetic information.

Additional Questions

1) Which of the following is the site of lipid synthesis?
Answer: B. Smooth ER
Solution: The smooth endoplasmic reticulum synthesizes lipids, unlike rough ER (proteins), Golgi (processing), or ribosomes (protein synthesis).

2) The membrane surrounding cell vacuole is called
Answer: A. Tonoplast
Solution: The tonoplast is the single membrane surrounding the vacuole in plant cells.

3) Cell theory was proposed by
Answer: A. Schleiden and Schwann
Solution: Schleiden and Schwann proposed the cell theory, as noted earlier.

4) The characteristic of blue-green algae is
Answer: D. All of the above
Solution: Blue-green algae (cyanobacteria) are prokaryotes, lacking a nucleus, nuclear membrane, and having DNA without histones.

5) The site of protein synthesis is
Answer: A. Ribosome
Solution: Ribosomes are the primary site of protein synthesis in all cells.

6) Vacuole in a plant cell
Answer: D. Is membrane-bound and contains water and excretory substances
Solution: Plant vacuoles are membrane-bound (by the tonoplast) and store water, nutrients, and waste.