CBSE Class 9 Science

Chapter 5: The Fundamental Unit of Life

IMPORTANT CONCEPTS & MOST REPEATED EXAM QUESTIONS — EXAM BOOSTER EDITION

SECTION 1: CHAPTER OVERVIEW

What is a Cell?

A cell is the smallest, basic structural and functional unit of life. All living organisms are made up of cells, which perform all essential life processes.

Why is the Cell Called the Fundamental Unit of Life?

Cells are called the fundamental unit of life because:

- All living organisms are composed of cells.
- All life processes (respiration, digestion, excretion) occur within cells.
- Tissues, organs, and organ systems are formed from groups of cells.

Cell Theory

The cell theory was proposed by Schleiden and Schwann and later modified by Virchow. It states:

- All living organisms are made up of cells.
- The cell is the basic structural and functional unit of life.
- All cells arise from pre-existing cells.

Importance of Cells

- Cells perform all essential life functions.
- They contain genetic material for inheritance.
- They enable growth, repair, and reproduction in organisms.

Chapter Summary Blueprint

- **Discovery:** Cell discovered by Robert Hooke (1665).
- **Cell Theory:** Proposed by Schleiden, Schwann, and Virchow.
- **Key Structures:** Plasma membrane, nucleus, cytoplasm, cell organelles.
- **Plant vs Animal Cells:** Major differences in cell wall, plastids, vacuoles.
- **Prokaryotic vs Eukaryotic:** Presence/absence of nuclear membrane and membrane-bound organelles.

SECTION 2: IMPORTANT CONCEPTS

1. Discovery of the Cell

Definition: The cell was discovered by an English botanist, Robert Hooke, in 1665.

Explanation: Hooke observed thin slices of cork under a self-designed microscope and saw small, box-like structures which he named "cells". Later, Leeuwenhoek observed living cells for the first time.

NCERT Point: Robert Hooke discovered cells while observing cork slices.

Important Exam Notes: Remember the year (1665) and the scientist (Robert Hooke).

2. Cell Theory

Definition: A scientific theory that explains the relationship between cells and living organisms.

Explanation: All living organisms are made up of cells. The cell is the basic structural and functional unit of life. All cells arise from pre-existing cells (Virchow).

NCERT Point: Schleiden (botanist) and Schwann (zoologist) proposed the cell theory. Virchow added the concept of "Omnis cellula-e-cellula" (cells arise from pre-existing cells).

Important Exam Notes: This is a frequently asked question in exams.

3. Cell Shape and Size

Definition: Cells vary in shape and size depending on their function.

Explanation:
• **Shape:** Cells can be spherical, oval, spindle-shaped, or irregular. The shape of the cell is related to its function (e.g., nerve cells are long for transmitting messages).
• **Size:** Most cells are microscopic (0.5–100 µm). The smallest cell is Mycoplasma (0.3 µm), while the largest is the ostrich egg (about 17 cm).

Important Exam Notes: Cells are adapted to their specific functions.

4. Unicellular Organisms

Definition: Organisms made up of a single cell.

Examples: Amoeba, Paramecium, Chlamydomonas, bacteria.

Important Exam Notes: A single cell performs all life functions in these organisms.

5. Multicellular Organisms

Definition: Organisms made up of many cells.

Examples: Humans, plants, animals, fungi.

Important Exam Notes: Cells in multicellular organisms are specialized for different functions.

6. Plasma Membrane

Definition: The outermost covering of the cell that separates the contents of the cell from its external environment.

Explanation: Also called the cell membrane. It is made up of lipids and proteins. It is selectively permeable, allowing only certain substances to pass through.

> **NCERT Point:** The plasma membrane is flexible and regulates the movement of substances in and out of the cell.

> **Important Exam Notes:** This is the most important concept in the chapter. Remember the term "selectively permeable".

7. Diffusion

Definition: The movement of molecules (gases like CO_2 and O_2) from a region of higher concentration to a region of lower concentration.

Explanation: Example: CO_2 moves out of cells during respiration because its concentration is higher inside the cell. No energy is required (passive transport).

> **NCERT Point:** Diffusion is important for the exchange of gases in cells.

> **Important Exam Notes:** Understand the concentration gradient concept.

8. Osmosis

Definition: The movement of water molecules through a selectively permeable membrane from a region of high water concentration to a region of low water concentration.

Explanation:
- **Hypotonic solution:** Lower solute concentration outside → cell gains water (swells).
- **Isotonic solution:** Equal solute concentration → no net movement.
- **Hypertonic solution:** Higher solute concentration outside → cell loses water (shrinks).

> **NCERT Point:** Osmosis is essential for water absorption by plant roots.

> **Important Exam Notes:** This is a high-priority question with examples.

9. Cell Wall

Definition: A rigid outer covering present in plant cells, located outside the plasma membrane.

Explanation: Made up of cellulose. Provides structural strength and support to plants. It is permeable (allows water and solutes to pass through).

> **NCERT Point:** Cell wall is absent in animal cells.

> **Important Exam Notes:** The difference between cell wall and cell membrane is a common question.

10. Nucleus

Definition: The largest organelle, containing the cell's genetic material.

Explanation: Also called the "brain" or "director" of the cell. It controls all cell activities and heredity. It contains chromosomes with DNA.

> **Important Exam Notes:** The nucleus plays a central role in cellular reproduction.

11. Nuclear Membrane

Definition: A double-layered membrane that encloses the nucleus.

Explanation: Has pores that allow the transfer of materials between the nucleus and cytoplasm. Protects the genetic material.

> **Important Exam Notes:** Prokaryotic cells lack a nuclear membrane.

12. Chromosomes

Definition: Thread-like structures in the nucleus that carry hereditary information.

Explanation: Composed of DNA and proteins. Visible only when the cell is about to divide. Contain genes (functional segments of DNA).

> **Important Exam Notes:** Chromosomes are the carriers of genetic information.

13. Genes

Definition: Functional segments of DNA that carry specific genetic information.

Explanation: Genes determine inherited traits from parents to offspring.

> **Important Exam Notes:** Genes are located on chromosomes.

14. Cytoplasm

Definition: A jelly-like substance present between the plasma membrane and the nucleus.

Explanation: Contains water, nutrients, and waste products. Houses all cell organelles. Responsible for various metabolic activities.

> **Important Exam Notes:** It is the site of most cellular activities.

15. Cell Organelles

Definition: Specialized structures within a cell that perform specific functions.

Explanation: Important organelles include Endoplasmic Reticulum (ER), Ribosomes, Golgi Apparatus, Lysosomes, Mitochondria, Plastids, and Vacuoles.

> **Important Exam Notes:** Each organelle has a specific function.

16. Endoplasmic Reticulum (ER)

Definition: A large network of membrane-bound tubes and sheets.

Types:
• **Rough ER (RER):** Has ribosomes attached; involved in protein synthesis.
• **Smooth ER (SER):** No ribosomes; involved in lipid synthesis.

> **Important Exam Notes:** SER plays a role in detoxification in liver cells.

17. Ribosomes

Definition: Tiny, non-membranous organelles where proteins are synthesized.

Explanation: Found floating in cytoplasm or attached to RER. Called the "protein factories" of the cell.

> **Important Exam Notes:** Proteins are synthesized in ribosomes.

18. Golgi Apparatus

Definition: A system of membrane-bound vesicles arranged in stacks, first described by Camillo Golgi.

Functions: Storage, modification, and packaging of products; formation of lysosomes; synthesis of complex sugars from simple sugars.

> **Important Exam Notes:** It is the "post office" of the cell.

19. Lysosomes

Definition: Small, single membrane-bound organelles filled with digestive enzymes.

Functions: Digestion of waste materials and worn-out organelles. Destruction of foreign materials (bacteria). Called the "suicide bags" because they can digest their own cell when damaged.

> **Important Exam Notes:** The "suicide bag" question is very common.

20. Mitochondria

Definition: Oval-shaped, double-membrane-bound organelles.

Functions: Site of cellular respiration. Release energy in the form of ATP (Adenosine Triphosphate). Called the "powerhouse of the cell".

> **NCERT Point:** Mitochondria have their own DNA and ribosomes.

> **Important Exam Notes:** Remember the term ATP and "powerhouse".

21. Plastids

Definition: Double-membrane-bound organelles found only in plant cells.

Types:
• **Chloroplasts:** Green-colored; contain chlorophyll for photosynthesis.
• **Chromoplasts:** Colored plastids (red, yellow, orange); give color to fruits and flowers.
• **Leucoplasts:** Colorless; store starch, proteins, and oils.

> **NCERT Point:** Plastids have their own DNA and ribosomes.

> **Important Exam Notes:** Chloroplasts are important for photosynthesis.

22. Chloroplast, 23. Leucoplast & 24. Chromoplast

• **Chloroplast:** Green plastid containing chlorophyll. Site of photosynthesis.

• **Leucoplast:** Colorless plastid. Functions to store starch, proteins, and oils.

• **Chromoplast:** Colored plastid. Imparts color to fruits and flowers, aiding in pollination.

25. Vacuoles

Definition: Membrane-bound, fluid-filled storage sacs.

Explanation: In plant cells, a large, central vacuole occupies up to 90% of the cell volume, providing turgidity and rigidity. In animal cells, they are small and temporary.

26. Prokaryotic Cell & 27. Eukaryotic Cell

• **Prokaryotic Cell:** Lacks a well-defined nucleus (has a nucleoid) and membrane-bound organelles. Single chromosome, small size (1-10 µm). Example: Bacteria.

• **Eukaryotic Cell:** Has a well-defined nucleus enclosed by a nuclear membrane, more than one chromosome, and membrane-bound organelles. Large size (5-100 µm). Example: Plant and animal cells.

28. Detailed Difference Table: Plant Cell vs Animal Cell

Feature	Plant Cell	Animal Cell
Cell Wall	Present (made of cellulose)	Absent
Shape	Rectangular / square style layout	Irregular / round style layout
Plastids	Present (chloroplast, chromoplast, leucoplast)	Absent
Vacuoles	Large and prominent (central)	Small or absent / temporary
Centrioles	Absent	Present
Mode of Nutrition	Autotrophic (photosynthesis)	Heterotrophic
Lysosomes	Few or absent	Present
Mitochondria	Fewer in number	More in number
Nucleus Position	Near the cell wall (eccentric)	Center of the cell

SECTION 3: TOP 30 FREQUENTLY REPEATED QUESTIONS

VERY SHORT ANSWER TYPE (1 MARK)

Q1. Who discovered the cell and how?

Ans: Robert Hooke discovered the cell in 1665 by observing thin slices of cork under a primitive microscope.

Q2. Why is the cell called the fundamental unit of life?

Ans: All living organisms are made up of cells, and all life processes occur inside cells.

Q3. What is the plasma membrane made of?

Ans: The plasma membrane is made of lipids and proteins.

Q4. Define osmosis.

Ans: Osmosis is the movement of water molecules through a semi-permeable membrane from a region of high water concentration to a region of low water concentration.

Q5. What is diffusion?

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

Q6. What is the full form of ATP?

Ans: Adenosine Triphosphate.

Q7. Which organelle is known as the powerhouse of the cell?

Ans: Mitochondria.

Q8. Why are lysosomes called suicide bags?

Ans: Because they contain digestive enzymes that can digest the entire cell when it gets damaged.

Q9. Which cell organelle is involved in protein synthesis?

Ans: Ribosomes.

Q10. What is the cell wall made of in plants?

Ans: Cellulose.

SHORT ANSWER TYPE (2-3 MARKS)

Q11. State the cell theory.

Ans: 1. All living organisms are made up of cells.
2. The cell is the basic structural and functional unit of life.
3. All cells arise from pre-existing cells.

Q12. What is the difference between diffusion and osmosis?

Ans: Diffusion: Movement of any molecules from high to low concentration; does not require a semi-permeable membrane.
Osmosis: Movement of only water molecules through a selectively permeable membrane.

Q12b. Why is the plasma membrane called selectively permeable?

Ans: The plasma membrane allows only certain substances to pass through while preventing others, maintaining internal balance.

Q13. What would happen if the plasma membrane ruptures?

Ans: If the plasma membrane ruptures, the cell contents will spill out, it would not be able to exchange materials selectively with its surroundings, and the cell would die.

Q14. What are genes? Where are they located?

Ans: Genes are the functional units of DNA that carry hereditary information. They are located linearly on chromosomes in the nucleus.

Q15. What are the functions of the Golgi apparatus?

Ans: Storage, modification, and packaging of biochemical products in vesicles; formation of lysosomes; and synthesis of complex sugars.

Q16. Where are proteins synthesized inside the cell?

Ans: Proteins are synthesized on ribosomes, which may float freely or be attached to the Rough Endoplasmic Reticulum (RER).

Q17. How does an Amoeba obtain its food?

Ans: Amoeba uses pseudopodia (temporary finger-like extensions) to engulf food particles via endocytosis, forming a food vacuole where digestion occurs.

Q18. What is plasmolysis?

Ans: When a living plant cell loses water through osmosis in a hypertonic solution, the content of the cell shrinks away from the cell wall. This process is called plasmolysis.

Q19. What are the components of the nucleus?

Ans: The nucleus consists of a nuclear membrane (with pores), nucleoplasm, nucleolus, and chromatin material (chromosomes).

SECTION 4: TOP 20 MOST EXPECTED QUESTIONS

Q1. Differentiate between prokaryotic and eukaryotic cells.

Ans:

Feature	Prokaryotic Cell	Eukaryotic Cell
Nucleus	Not well-defined (nucleoid), no nuclear membrane	Well-defined with nuclear membrane
Size	Small (1-10 µm)	Large (5-100 µm)
Chromosomes	Single	More than one
Organelles	Membrane-bound organelles absent	Membrane-bound organelles present
Examples	Bacteria, Blue-green algae	Plant and animal cells

> *Why Important: Core concept frequently tested as a long-answer question.*

Q2. Differentiate between plant cells and animal cells.

Ans: Refer to Section 2, item 28 difference table for comprehensive comparison including cell wall, plastids, vacuoles, and shape features.

> *Why Important: Highly repeated high scoring basic school question.*

Q3. Describe the structure and functions of mitochondria.

Ans:
• **Structure:** Oval-shaped, double-membrane bound. Outer membrane is smooth and highly porous; inner membrane is deeply folded into finger-like projections called cristae to maximize surface area.
• **Functions:** Acts as the site for cellular respiration; converts nutrients into chemical energy stored in ATP molecules. Thus called the "powerhouse of the cell". Contains its own DNA and ribosomes.

Q4. Describe the structure and functions of lysosomes.

Ans: Small spherical single-membrane sacs packed with powerful hydrolytic digestive enzymes. Functions include digesting foreign waste, breaking down old cellular components, and triggering autolysis ("suicide bags") during extreme distress.

Q5. Explain the process of osmosis with its types.

Ans: Osmosis is water movement through a semi-permeable membrane. The direction depends on solute concentration: Hypotonic (cell swells), Isotonic (no net change), Hypertonic (cell shrinks due to exosmosis).

Q6. What is the function of the endoplasmic reticulum? Name its types.

Ans: Acts as an internal transport network and structural framework for metabolism. Types: 1. Rough ER (RER with ribosomes) for protein production. 2. Smooth ER (SER) for lipid manufacturing and toxic substance detoxification.

Q7. What is the function of the cell wall?

Ans: Provides absolute mechanical and structural strength, protects the plant from external pressure, and prevents cell rupture during high endosmosis.

Q8. Describe the structure of the nucleus. Why is it called the director of the cell?

Ans: It consists of a double-layered membrane with nuclear pores enclosing the nucleoplasm, nucleolus, and chromatin text threads. It is the "director" because it stores master blueprints (DNA) and controls all metabolic actions and reproduction.

Q9. How do substances like CO_2 and water move in and out of the cell?

Ans: Carbon dioxide shifts passively via simple **diffusion** down its chemical concentration gradient. Water shifts across the selectively permeable plasma membrane via **osmosis**.

Q10. What are the three types of plastids? Write their functions.

Ans: Chloroplasts contain green chlorophyll for active solar harvesting (photosynthesis). Chromoplasts contain pigments ensuring colorful fruit/flower display. Leucoplasts are clear and function as nutrient storage (starch/oil).

SECTION 5: NCERT-BASED QUESTIONS

Intext Solutions

Q1. Who discovered cells and how?
Ans: Robert Hooke in 1665 while observing a thin slice of dead tree cork under his self-made primitive microscope lens.

Q2. Why is the cell called the structural and functional unit of life?
Ans: Because it is the smallest organized unit capable of living independently and performing every single core biological function required for sustenance.

Q3. How do substances like CO_2 and water move in and out of the cell? Discuss.
Ans: Gaseous CO_2 exchanges directly across the cell membrane via diffusion. Water exchanges down its potential gradient using osmosis.

Q4. Why is the plasma membrane called a selectively permeable membrane?
Ans: Because it regulates transport by allowing preferred choice particles to traverse while restricting hazardous entries.

Q5. Can you name the two organelles studied that contain their own genetic material?
Ans: Mitochondria and Plastids.

Q6. If the organization of a cell is destroyed due to some physical or chemical influence, what will happen?
Ans: The cell loses metabolic viability, active homeostatic functioning stops, and cellular death or degradation follows quickly via lysosomal activation.

Q7. Why are lysosomes known as suicide bags?
Ans: When metabolic processes rupture, lysosomal membranes break open, releasing hydrolytic enzymes that digest their own cytoplasm completely.

Q8. Where are proteins synthesized inside the cell?
Ans: Inside the ribosomes.

Back Exercise Solutions

Q1. Make a comparison and write down ways in which plant cells are different from animal cells.
Ans: Plant cells feature rigid cellulose cell walls, large fixed central vacuoles, and chloroplast plastids. Animal cells completely lack cell walls and plastids, and use multiple small transient vacuoles.

Q2. How is a prokaryotic cell different from a eukaryotic cell?
Ans: Prokaryotes maintain an un-demarcated open nuclear zone (nucleoid) lacking a membrane barrier and do not have cell organelles like mitochondria or ER. Eukaryotes possess a defined double-walled nucleus and organized membrane organelles.

Q3. What would happen if the plasma membrane ruptures or breaks down?
Ans: Internal cytoplasm components spill out uncontrollably, chemical regulation fails, and life functions cease immediately.

Q4. What would happen to the life of a cell if there was no Golgi apparatus?
Ans: Proteins and lipids manufactured by the Endoplasmic Reticulum will fail to get sorted, modified, packaged, or dispatched. Lysosome formation would halt, paralyzing waste disposal pathways.

Q5. Which organelle is known as the powerhouse of the cell? Why?
Ans: Mitochondria, because they execute oxygen-driven respiration cycles to capture metabolic energy into usable ATP currency molecules.

Q6. Where do the lipids and proteins constituting the cell membrane get synthesized?
Ans: Lipids are synthesized by the Smooth Endoplasmic Reticulum (SER); proteins are synthesized by ribosomes on the Rough Endoplasmic Reticulum (RER).

SECTION 6: ASSERTION & REASON QUESTIONS

Directions: Select (a) if both A and R are true and R is the correct explanation. Select (b) if both A and R are true but R is not the correct explanation. Select (c) if A is true but R is false. Select (d) if A is false but R is true.

Q1. Assertion (A): The plasma membrane is called a selectively permeable membrane.
Reason (R): It allows only certain substances to pass through while preventing others.
Ans: (a) Both A and R are true, and R is the correct explanation of A.

Q2. Assertion (A): Lysosomes are called suicide bags.
Reason (R): They contain digestive enzymes that can digest the entire cell.
Ans: (a) Both A and R are true, and R is the correct explanation of A.

Q3. Assertion (A): Mitochondria are called the powerhouse of the cell.
Reason (R): They synthesize ATP during respiration.
Ans: (a) Both A and R are true, and R is the correct explanation of A.

Q4. Assertion (A): Plant cells have large central vacuoles.
Reason (R): Vacuoles provide turgidity and rigidity to plant cells.
Ans: (a) Both A and R are true, and R is the correct explanation of A.

Q5. Assertion (A): Rough ER has ribosomes attached to its surface.
Reason (R): Smooth ER helps in protein synthesis.
Ans: (c) A is true, but R is false. Smooth ER synthesizes lipids, not proteins.

Q6. Assertion (A): Osmosis is a type of diffusion.
Reason (R): Both involve the movement of molecules from high to low concentration.
Ans: (b) Both A and R are true, but R is not the direct precise explanation. Osmosis specifically requires a semi-permeable membrane and water molecules.

SECTION 7: CASE STUDY QUESTIONS

Case Study 1: Osmosis in Potato Experiment

Four peeled potato halves were hollowed out to make cups. One cup (A) was kept empty. Cup B had one teaspoon of sugar, Cup C had one teaspoon of salt, and Cup D (boiled potato) had one teaspoon of sugar. All cups were placed in a trough containing water for two hours. Water gathered in cups B and C but not in A and D.

Q1. Why did water gather in the hollowed portion of B and C?
Ans: Concentrated sugar and salt solutes formed a hypertonic environment inside the cup, prompting outer water to flood inside through osmotic forces.

Q2. Why was potato A necessary for the experiment?
Ans: It acted as a baseline control showing that without a solute concentration gradient, water does not shift.

Q3. Why did water not gather in D (boiled potato)?
Ans: Thermal boiling kills the living protoplasmic tissue, rupturing cell membrane selectivity. Osmosis cannot occur across dead cell barriers.

Case Study 2: Lysosomes as Waste Disposal

Lysosomes contain powerful digestive enzymes capable of breaking down all organic material. They act as the waste disposal system of the cell.

Q1. What are lysosomes?
Ans: Tiny spherical single membrane organelles holding intensive hydrolytic digestive enzymes.

Q2. What happens if they vanish?
Ans: Toxic metabolic waste fragments collect inside the cytoplasm, leading to rapid cellular toxicity and structural failure.

SECTION 8: DIAGRAM-BASED LABELLING GUIDES

Practice drawing these structures carefully for the practical examination. Ensure the following key labels are included:

Q1. PLANT CELL BLUEPRINT

- Cell Wall (outer rigid layer)
- Plasma Membrane (inner layer)
- Large Central Vacuole (90% space)
- Chloroplasts (oval green disks)
- Nucleus (pushed to periphery)
- Mitochondria, Golgi, ER

Q2. ANIMAL CELL BLUEPRINT

- Plasma Membrane (outer boundary)
- Nucleus (perfectly centralized)
- Centrioles (orthogonal near nucleus)
- Lysosomes (small distributed circles)
- Multiple micro vacuoles
- Mitochondria (dense folding profiles)

Q3. NUCLEUS DETAIL

- Double Nuclear Membrane
- Nuclear Pores (breaks in membrane)
- Nucleolus (dark core)
- Chromatin Network (tangled threads)

Q4. MITOCHONDRIA STRUCTURE

- Outer Membrane (smooth capsule)
- Inner Membrane (infoldings)
- Cristae (the internal shelf folds)
- Matrix (dense inner fluid space)

SECTION 9: COMMON MISTAKES STUDENTS MAKE

1. Confusing Cell Wall vs Cell Membrane

Students regularly describe cell walls as selectively permeable. *Correction:* The cell wall is completely porous and permeable; selectivity is handled purely by the inner plasma membrane.

2. Equating Diffusion and Osmosis identically

Correction: Remember that osmosis is restricted to **liquid water movement** crossing over an active **selectively permeable membrane**. General gaseous exchange like CO_2 is simple diffusion.

3. Mixing Organelle Primary Roles

- **Mitochondria:** ATP creation only (not protein production).
- **Ribosomes:** Protein factory floor.
- **Golgi:** Logistics post-office (packaging/sorting).

SECTION 10: QUICK REVISION SHEET

Key Historical Milestones	
1665	Robert Hooke discovers dead cells in cork
1831	Robert Brown discovers cell Nucleus
1839	Schleiden & Schwann propose Cell Theory
1855	Virchow states cells arise from old cells

Organelle Cheat-Sheet	
Lysosomes	Suicide Bags / Waste Recycling
Mitochondria	Powerhouse / ATP Generator
Golgi	Cellular Post-Office Box
Chloroplast	Kitchen of the Plant Cell

SECTION 11: EXAM BOOSTER SECTION

Top 15 Questions with Highest Probability of Appearing in Core Exams:

1. Write the core structural differences between prokaryotic and eukaryotic cells with example taxa.
2. Tabulate distinct differences dividing plant cell structures from animal cell layouts.
3. Why is the outer plasma membrane specifically defined as a selectively permeable barrier?
4. Provide the clear biological mechanism explaining why lysosomes are called 'suicide bags'.
5. Why are mitochondria labeled the distinct 'powerhouse of the cell'? Mention its structural adaptations.
6. Explain the complete dynamic process of osmosis across hypotonic and hypertonic environments.
7. Describe the detailed composition, anatomy, and control functions of the nucleus.
8. Enumerate the primary logistics and synthesis activities of the Golgi apparatus.
9. Differentiate between the structural presentation and functional delivery of RER versus SER.
10. Elucidate the physical steps used by an Amoeba to execute food engulfment via pseudopodia.
11. State the three core pillars constituting modern Cell Theory and name the contributing scientists.
12. Name the three distinct families of plant plastids along with their targeted physiological functions.
13. Explain step-by-step how carbon dioxide waste and water molecules cross cell structures.
14. What are genes, what macromolecule makes them up, and exactly where are they situated?
15. Define plasmolysis with a clear description of what happens to a plant cell in a dense sugar syrup.