INDIAN SCHOOL AL WADI AL KABIR

Class: XI	**DEPARTMENT OF SCIENCE 2026 – 2027** **SUBJECT: BIOLOGY**	**Date: 16/04/2026**
Worksheet: 01	**UNIT- III Cell Structure and Functions** **CHAPTER:08- Cell: The Unit of Life**	**Note:** **A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT**	**ROLL NO.**

I. MULTIPLE CHOICE QUESTIONS (1M)

1. According to the fluid-mosaic model proposed by Singer and Nicolson, the quasi-fluid nature of lipids enables lateral movement of proteins within the overall bilayer. This ability to move within the membrane is measured as its:
   A. Permeability
   B. Fluidity
   C. Solubility
   D. Rigidity
2. Which of the following organelles is NOT considered a part of the endomembrane system?
   A. Golgi complex
   B. Peroxisome
   C. Lysosome
   D. Vacuoles
3. What is the arrangement of microtubules in the axoneme of eukaryotic cilia and flagella?
   A. 9 + 0
   B. 9 + 2
   C. 7 + 2
   D. 9 + 1
4. Which face of the Golgi apparatus is the "forming face" that typically receives vesicles from the Endoplasmic Reticulum (ER)?
   A. Trans face
   B. Maturing face
   C. Cis face
   D. Concave face
5. Ribosomes found inside chloroplasts and mitochondria are of which type?
   A. 80S
   B. 70S
   C. 60S
   D. 50S

Two statements are given - one labelled as **Assertion (A)** and the other labelled as **Reason (R)**. Select the correct answer to these questions from the codes (A), (B), (C), and (D) as given below.

A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).
B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of

the Assertion (A).

C. Assertion (A) is true, Reason (R) is false.

D. Assertion (A) is false, Reason (R) is true.

6. **Assertion (A):** The cell is the basic structural and functional unit of all living organisms.
   Reason (R): Anything less than a complete structure of a cell does not ensure independent living.
7. **Assertion (A):** Ribosomes are non-membrane-bound organelles found only in eukaryotic cells cells.
   Reason (R): They are the sites for protein synthesis.
8. **Assertion (A):** Prokaryotic cells lack a well-defined nucleus.
   Reason (R): Genetic material in prokaryotes is naked and not enveloped by a nuclear membrane.
9. **Assertion (A):** Secondary constriction in some chromosomes gives them the appearance of a small fragment called a satellite.
   Reason (R): Satellites are found at a constant location on all chromosomes in a human cell.

VERY SHORT ANSWER TYPE QUESTIONS(2M)

10. Mention two differences between SER & RER.
11. What are the cell inclusions in a prokaryotic cell?
12. Differentiate between Gram-positive and Gram-negative bacteria.
13. What are mesosomes? State their functions in a prokaryotic cell.
14. What are nuclear pores? State their function.

II. SHORT ANSWER TYPE QUESTIONS (3M)

15. Explain the Fluid Mosaic Model of the cell membrane.
16. Give a brief description of the cell envelope in prokaryotes.
17. Name the organelles that are coming under the endomembrane system. Why are they known so?
18. What are the three main types of Plastids? State their functions.

III. CASE STUDY BASED QUESTIONS (4M)

19. A student is observing two double-membrane-bound organelles under an electron microscope. Organelle A is sausage-shaped or cylindrical and contains numerous inner foldings called cristae, which increase the surface area for ATP production. Organelle B is found only in plant cells and contains green pigments trapped in flattened sacs called thylakoids, which are stacked like coins to form grana. Both organelles are unique because they contain their own circular DNA and 70S ribosomes, allowing them to synthesize some of their own proteins.
    A. Identify Organelle A and Organelle B.
    B. Why are these two organelles called "semi-autonomous"?
    C. State the functional significance of the "cristae" in Organelle A.
    D. What is the specific role of the "Stroma" in Organelle B?

IV. LONG ANSWER TYPE QUESTIONS (5M)

20. Name two cell organelles that are double membrane-bound. What are the characteristics of these two organelles? State their functions and draw labelled diagrams of both.
21. Describe the ultrastructure of a cilium or flagellum.
22. Describe the structural organization of a typical eukaryotic chromosome. What are the different types of chromosomes based on the position of the centromere?
23. Describe the structure of the nucleus with the help of labelled diagram.

Answer Key

Q. No.	Answer
I.	**MULTIPLE CHOICE QUESTIONS (1M)**
1	B Fluidity
2	B. Peroxisome
3	B. 9 + 2
4	C. Cis face
5	B. 70S
	ASSERTION & REASONING
6.	A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).
7	D. Assertion (A) is false, Reason (R) is true.
8	A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).
9	C. Assertion (A) is true, Reason (R) is false.
II	**VERY SHORT ANSWER TYPE QUESTIONS(2M)**
10	**RER:** Has ribosomes attached to its surface and is primarily involved in protein synthesis and secretion. **SER:** Lacks ribosomes on its surface and is involved in the synthesis of lipids, steroids, and the detoxification of drugs.
11	In prokaryotic cells, reserve materials are stored in the cytoplasm as inclusion bodies. • **Key Features:** They are not bound by any membrane system and lie free in the cytoplasm. • **Examples:** Phosphate granules, cyanophycean granules, and glycogen granules. • Gas vacuoles are found in blue-green and purple/green photosynthetic bacteria.
12	**Gram-positive:** They take up and retain the Gram stain (crystal violet) due to a thick peptidoglycan layer in their cell wall. **Gram-negative:** They do not retain the Gram stain and have a thinner peptidoglycan layer with an outer lipopolysaccharide membrane.
13	A mesosome is a unique membranous structure formed by the extensions of the plasma membrane into the cell. If it is found attached to the nucleoid, it is known as a septal mesosome and is known as a lateral mesosome if the mesosome is free from the nucleoid. The functions of mesosomes are as follows: • They help in cell-wall formation • They help in DNA replication and distribution to daughter cells. • They also help in respiration and secretion processes to increase the surface area of the plasma membrane and enzymatic content.
14	At several places, the nuclear membrane is surrounded by minute pores formed by the fusion of two membranes called nuclear pores. They are simple perforations on the nuclear envelope. **Functions:** • Retains the shape of the nucleus • Known to preserve the stability of the genetic material by safeguarding it from respiratory breakdown occurring in the cytoplasm • Responsible for the movement of RNA and protein molecules in both directions between the nucleus and the cytoplasm.
III	**SHORT ANSWER TYPE QUESTIONS (3M)**
15	• The improved model of the structure of the cell membrane was proposed by Singer and Nicolson (1972**)** and widely accepted as the fluid-mosaic model.

	• According to this, the quasi-fluid nature of lipid enables lateral movement of proteins within the overall bilayer. • This ability to move within the membrane is measured as its fluidity. • The fluid nature of the membrane is also important from the point of view of functions like cell growth, formation of intercellular junctions, secretion, endocytosis, cell division, etc. • Depending on the ease of extraction, membrane proteins can be classified as peripheral and integral. • Peripheral proteins lie on the surface of the membrane, while the integral proteins are partially or totally buried in the membrane.
16	The prokaryotic cell envelope is a complex, three-layered protective unit. While each layer has a distinct function, they act together as a single unit: 1. **Glycocalyx (Outermost):** A coating that varies in thickness. It can be a loose slime layer (prevents water loss) or a thick, tough capsule (protects from the host immune system). 2. **Cell Wall (Middle):** Primarily made of peptidoglycan. it determines the cell's shape and provides structural support to prevent the bacterium from bursting or collapsing. 3. **Plasma Membrane (Innermost):** A semi-permeable membrane that regulates the entry and exit of molecules. It forms internal extensions called **mesosomes**, which help in respiration, DNA replication, and cell wall formation.
17	The Endomembrane System includes the following organelles: • **Endoplasmic Reticulum (ER)** • **Golgi apparatus** • **Lysosomes** • **Vacuoles** **Reason for Grouping:** While each of these organelles is distinct in terms of its structure and specific function, they are considered together as an endomembrane system because their functions are coordinated. **Coordination:** The coordination is seen in the flow of materials: proteins or lipids synthesized in the ER are modified and packaged in the Golgi apparatus, then transported to their destinations via lysosomes or stored/disposed of through vacuoles. **Exceptions:** Organelles such as mitochondria, chloroplasts, and peroxisomes are *not* part of the endomembrane system because their functions are not coordinated with the organelles listed above.
18	**1. Chloroplasts** • These contain chlorophyll and carotenoid pigments. • They are the primary sites for photosynthesis, where they capture light energy to synthesize food (glucose). • They are found mostly in the mesophyll cells of leaves. **2. Chromoplasts** • They contain fat-soluble carotenoids like carotene and xanthophylls. • They provide bright colors such as yellow, orange, or red to flowers and fruits. • These colors are essential for attracting insects for pollination and animals for seed dispersal. **3. Leucoplasts** • These are colourless plastids of various shapes and sizes.

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Their main function is the storage of nutrients. They are categorized based on the substance they store:

Amyloplasts: Store carbohydrates (starch), e.g., in potato tubers.
Elaioplasts: Store oils and fats.
Aleuroplasts: Store proteins.

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<tr><td>IV</td><td>CASE STUDY BASED QUESTIONS (4M)</td></tr>
<tr><td rowspan="4">19</td><td>A. Organelle A is the Mitochondrion. Organelle B is the Chloroplast.</td></tr>
<tr><td>B. They are called semi-autonomous because they possess their own extrachromosomal DNA and ribosomes (70S type), enabling them to replicate and synthesize some of their own proteins independently of the nucleus.</td></tr>
<tr><td>C. The cristae are infoldings of the inner membrane that significantly increase the surface area available for enzymatic actions related to aerobic respiration and ATP generation.</td></tr>
<tr><td>D. The stroma is the fluid-filled space limited by the inner membrane of the chloroplast. It contains the enzymes necessary for the synthesis of carbohydrates and proteins.</td></tr>
<tr><td>V</td><td>LONG ANSWER TYPE QUESTIONS (5M)</td></tr>
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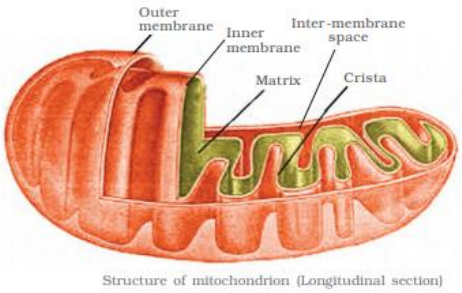
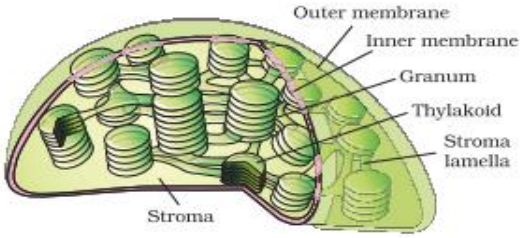


Structure of mitochondrion (Longitudinal section)
Two organelles that are double membrane-bound are i) Mitochondria ii) Chloroplasts
Characteristics of mitochondria
The mitochondrion is a double-membrane-bound structure with the outer and inner membranes dividing its lumen into two aqueous compartments, i.e., the outer and inner compartments.

Mitochondria are semi-autonomous as they possess their own DNA.
Mitochondria are the place of aerobic respiration.

Characteristics of Chloroplasts

They are found in plants and euglenoids, variously shaped in lower plants and disc-shaped in higher plants.
They have specific pigments that impart colour to the leaves of the plants.
Chloroplasts possess their own DNA.
Pigments help to trap sunlight, thereby helping in photosynthesis.
It consists of membrane-flattened sacs known as thylakoids located in their matrix. At some locations, thylakoids are stacked and are known as Gana.



Sectional view of chloroplast
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Both cilia and flagella are hair-like outgrowths of the cell membrane and are covered by the plasma membrane.
Their internal core, called the axoneme, possesses several microtubules running parallel to the long axis.
The axoneme usually has nine pairs (doublets) of radially arranged peripheral microtubules and a pair of centrally located microtubules. This is called the 9 + 2 array.
The central tubules are connected by bridges and are enclosed by a central sheath.

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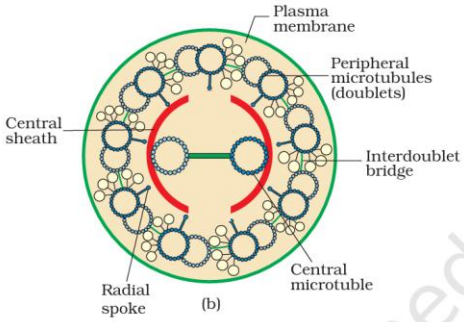
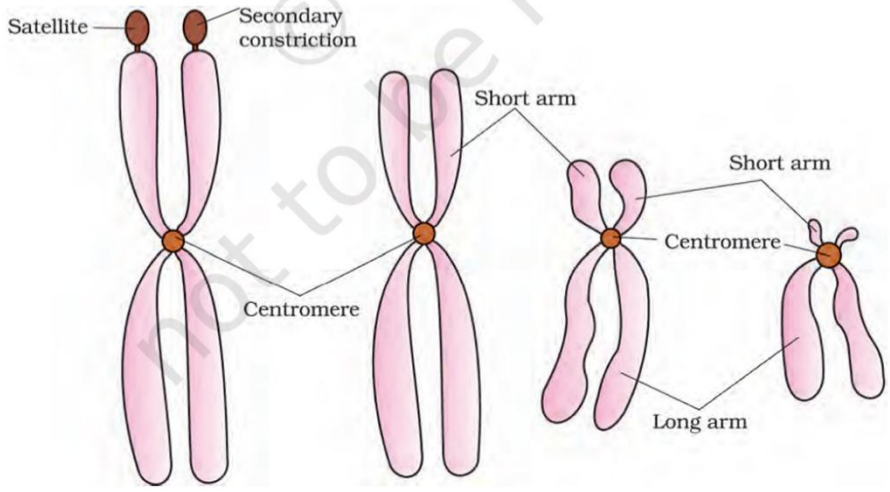
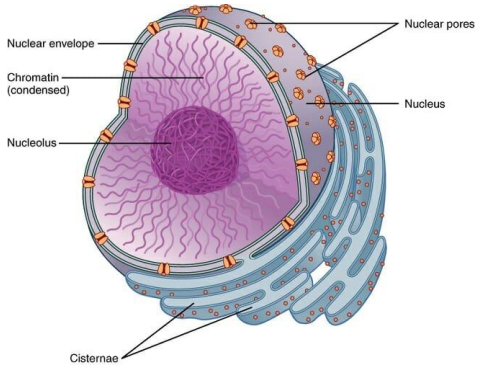
	• The central sheath is connected to one of the tubules of each peripheral doublet by a radial spoke. Thus, there are nine radial spokes. • Linkers also interconnect the peripheral doublets. • Both the cilium and flagellum emerge from centriole-like structures called the basal bodies. 
22	**Structural Organization** • Every chromosome possesses a primary constriction called the **c**entromere. • **Kinetochores:** On the sides of the centromere, disc-shaped structures called kinetochores are present, which serve as attachment sites for spindle fibers. • **Chromatids:** A chromosome consists of two identical strands called sister chromatids held together at the centromere. • **Satellite:** Occasionally, some chromosomes have non-staining secondary constrictions at a constant location, giving the appearance of a small fragment called a **s**atellite. **Types of Chromosomes (Based on Centromere Position)** 1. **Metacentric:** The centromere is in the middle, forming two equal arms of the chromosome. 2. **Sub-metacentric:** The centromere is situated slightly away from the middle, resulting in one shorter arm and one longer arm. 3. **Acrocentric:** The centromere is situated close to its end, forming one extremely short and one very long arm. 4. **Telocentric:** The centromere is located at the terminal end (at the very tip).  **Figure 8.13** Types of chromosomes based on the position of centromere

23	**i)** The nucleus is an oval-shaped or round structure having a double membrane containing the genetic material. It consists of five parts, namely – the nuclear envelope, nuclear matrix, nucleoplasm, nucleolus and chromatin. Nuclear envelope – The nucleus is constrained by the nuclear pore, which is a double-membrane nuclear envelope having tiny pores in the membrane which serve as a channel for substances to pass in and out of the nucleus. The endoplasmic reticulum is connected to the outer membrane, which also contains ribosomes. Nucleoplasm – It is the fluid, filled in the nucleus containing enzymes, nucleosides, proteins and other factors responsible for the functioning of the genetic material. It also embeds the chromatin fibres and nucleolus. Chromatin – They are found inside the nucleus; they are a fine network of thread-like structures containing DNA and a few basic proteins such as histones, RNA and non-histone proteins. These chromatin fibres, during the process of cell division, condense to form the chromosomes. Nucleolus – They are attached to the chromatin and are round, lightly irregular, naked structures that produce the ribosome subunits. They produce proteins. 

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