

NEET Important Questions with Solutions from Cell : The Unit of Life

Q.1. Identify the mis-matched from the following:

- A) Linkage - T. H. Morgan
- B) Ribosomes - George Palade
- C) Lac Operon - Jacob and Monod
- D) Omnis cellula e cellula - Beijerinck

Answer: Omnis cellula e cellula - Beijerinck

Solution: The cell theory was proposed by Schwann and Schleiden. But this theory failed to explain the formation of new cells. Rudolf Virchow (1855) who explained for the first time that new cells are formed by cell division from pre-existing cells (Omnis cellula-e-cellula).

Q.2. Peptide synthesis inside a cell takes place in:

- A) Chloroplast
- B) Mitochondria
- C) Chromoplast
- D) Ribosomes

Answer: Ribosomes

Solution: **A ribosome** is a cell organelle whose main **functions to synthesise peptides or proteins**. They are found either free in the cytoplasm or attached to the endoplasmic reticulum to form a rough endoplasmic reticulum. This cell organelle is present in both prokaryotic and eukaryotic cells.

Ribosomes are composed of proteins and rRNA. Ribosomes are divided into two sections, known as subunits. Prokaryotes have 70S ribosomes (made from the 30S and a 50S subunit). While the Eukaryotes have the 80S (made of the 40S and 60S subunit). 70S Ribosomes are smaller in comparison to 80S.

Q.3. Which of the following type of RNA serves as a molecular building block for ribosome?

- A) mRNA
- B) rRNA
- C) tRNA
- D) snRNA

Answer: rRNA

Solution: The ribosome is made up of ribosomal RNA or rRNA. In the case of the eukaryotic cell, the ribosome is 80S type. Here, S stands for sedimentation constant (density centrifugation). The 80 S ribosomes have two subunits when independently subjected to centrifugation acquires the unit of 60S and 40S.

Ribosomal RNA is the ribosome's mechanical and physical factor that forces transfer RNA (tRNA) and messenger RNA (mRNA) to process and translate the latter into proteins. Ribosomal RNA is the form of RNA which is predominantly found in most cells; it makes up about 80% of cellular RNA despite never being translated into proteins. Ribosomes are composed of approximately 60% rRNA and 40% ribosomal proteins by mass.

Q.4. Intracellular compartments are not found in the cells of

- A) lower plants



- B) prokaryotes
- C) higher plants
- D) eukaryotes

Answer: prokaryotes

Solution:

- Cell is a basic unit of life and is considered as structural and functional unit of an organism.
- On the basis of presence or absence of well-defined nucleus, a cell can be classified as prokaryotic or eukaryotic cell.
- Prokaryotic cell do not contain a well-defined nucleus but a eukaryotic cell contain well-defined nucleus (containing nuclear membrane and a nucleolus).
- Most of the cell organelles are present in eukaryotic cell like mitochondria, chloroplast, vacuoles, lysosome, microbodies, sphaerosomes, ribosomes, centriole etc. These organelles when outlined by membranes, forms the intracellular compartments.
- Out of these organelles, the ones with a membrane forms compartmentalization inside a cell but the cell organelles without a membrane do not form such compartmentalization.
- **Prokaryotic cells** do not contain membrane-bound organelles, so intracellular compartments are not found in them.

Q.5. Nucleolus is an organelle responsible for the production of

- A) carbohydrates
- B) messenger RNA
- C) lipids
- D) ribosomal RNA

Answer: ribosomal RNA

Solution:

The process of making ribosomes is called Ribosome biogenesis. This process is a very tightly regulated process and is closely associated with other cellular activities like growth and division. In prokaryotes, this process takes place in the cytoplasm while in eukaryotes, it takes place in the nucleolus. It involves the synthesis and processing of the rRNA, and larger and numerous nucleoli present in cells actively synthesis proteins. The nucleoli are spherical and membrane less structures which are present in nucleus.

Q.6. Microtubules are present in

- A) bacteria
- B) viruses
- C) eukaryotes
- D) mycoplasma

Answer: eukaryotes

Solution:

Microtubules: The microtubules are **found in the cytoplasmic matrix of all eukaryotic cells**. They also occur in cilia, flagella, centrioles, basal bodies, mitotic apparatus, etc. **Prokaryotic cells lack microtubules**. The microtubules are hollow, unbranched cylinders, generally about 25 nm in diameter with a hollow core of about 15 nm in diameter. The boundary of a microtubule is composed of 13 parallel protofilaments. Each protofilament is made up of alpha and beta subunits of tubulin protein. The assembly and disassembly of microtubules require Ca^{2+} and GTP.

Functions:

- (i) These help in the spindles and astral rays formation during cell division.
- (ii) These form the cytoskeleton of cilia and flagella.
- (iii) These help in generating rigidity, shape and cell motility.
- (iv) Microtubules help in the anaphasic movement of chromosomes.
- (v) Microtubules help in the intracellular transport of inorganic ions and nutrients.



Q.7. The concept of cell lineage (cells arise from pre-existing cells only) '*cellula e cellula*' was propounded by

- A) Purkinje
- B) Virchow
- C) Swammerdam
- D) Robert Hooke

Answer: Virchow

Solution: New cell arises from pre-existing cells "Omnis cellula-e cellula." It is called cell lineage theory. This concept was given by **Rudolf Virchow (1855)**. Rudolf Virchow gave the final shape to the cell theory. The cell theory states that living organisms are composed of cells and products of cells that they are the basic structural/organisational unit of all organisms, and all cells come from pre-existing cells. Cells don't come into existence spontaneously from the inorganic constituents. The cell is a self-replicating, evolving, and self-regulating interactive system capable of responding to external stimuli.

In **1839**, **Purkinje** coined the term '*protoplasm*' for the fluid substance of a cell.

Robert Hooke (1665) discovered the cell. He first observed the cell in a piece of dead cork cells. He described cells in his book "Micrographia." Robert Hooke is known as the 'Father of cytology.'

Q.8. Which one is present in bacteria?

- A) Nucleus
- B) Golgi apparatus
- C) Mitochondria
- D) Ribosomes

Answer: Ribosomes

Solution: A cell that bears naked genetic material, i.e. nucleus is without envelope is known as a **prokaryotic cell**. These cells **do not have a true nucleus**. These cells only have incipient nucleus or genophore. This group is represented by **bacteria**, blue-green algae (cyanobacteria), mycoplasma.

Prokaryotic cells **do not have any membranous cell organelles like mitochondria, golgi apparatus, etc.**

Ribosomes are membrane-less cell organelles present in both prokaryotic and eukaryotic cells.

In prokaryotes, ribosomes are **associated with the plasma membrane of the cell**.

70S type of ribosomes is found in prokaryotic cells. Its two subunits are the 50S and 30S. Several ribosomes are joined with mRNA to form polysome or polyribosome for efficient conduction of protein synthesis.

Q.9. The middle lamella is composed of

- A) pectates
- B) cellulose
- C) lignin
- D) proteins

Answer: pectates

Solution: Middle lamella is the pectin-rich outermost layer of the mature cell wall in plants. It is the common layer between two cells, consisting of calcium and magnesium pectates (the relative amount of Ca is more). It is the first-formed layer during cytokinesis. During cell wall formation, calcium gets deposited in the cell wall. This mineral is required for the stability and functioning of the cell wall. Middle lamella forms connections between adjacent cells called plasmodesmata. Plasmodesmata are the small channels that are important for transportation and communication between two adjacent cells.

Q.10. Which one of the following helps in bacterial motility?



- A) Centrioles
- B) Fimbriae
- C) Microtubules
- D) Flagella

Answer: Flagella

Solution: Bacteria are the sole members of the prokaryotic kingdom, Monera. They are primitive cellular organisms with prokaryotic cells. There are no cellular organelles, like centrioles, mitochondria. Cytoskeletal elements like microtubules are also absent.

The cells may have projections, called fimbriae, which help them in attachment.

Flagella in bacteria are made up of solid-core protein, called flagellin. There are shafts, hooks and body of the flagella. They help bacteria in locomotion.

Q.11. Plasma membrane is;

- A) Selectively permeable
- B) Permeable
- C) Impermeable
- D) Partial permeable

Answer: Selectively permeable

Solution: The plasma membrane (cell membrane) is a selectivity permeable membrane and regulates the transport of materials in and out of the cell. Being selectively permeable, it allows the transport of some molecules present on its either side and also prevents the transport of some other molecules. The cell membrane is made up of glycerophospholipids, i.e., lipids, proteins and carbohydrates. Cell membrane consists of a phospholipid bilayer. A phospholipid molecule is made up of glycerol and fatty acids. It helps in cell to cell recognition, protection and enzymatic activity. The fluid nature of the cell membrane helps the cell to survive in various environments.

Q.12. The basis of grouping of living organisms into eukaryotes and prokaryotes is

- A) Ribosome
- B) Plasma membrane
- C) Nucleus
- D) None of these are correct

Answer: Nucleus



Solution: Basically there are two main types of cells: Prokaryotic and Eukaryotic.

Prokaryotic cells	Eukaryotic cells
<ol style="list-style-type: none">1. They are primitive type of cells.2. They lack membrane bound nucleus.3. The nuclear material is scattered in the cytoplasm.4. There are 70S type ribosomes.5. No membrane bound organelles are present.6. The cell wall, when present is made up of peptidoglycan.7. Cell membrane is lipid-protein bilayer type.8. Mesosomes are often found.	<ul style="list-style-type: none">• They are advanced type of cells.• They have membrane bound nucleus.• The nuclear material is inside the nucleus.• Cytoplasm has 80S type ribosomes. Organelles have 70S type ribosomes.• Membrane bound organelles are present.• The cell wall, when present is made up of chitin or cellulose.• Cell membrane is lipid-protein bilayer type.• Mesosomes are not found.

Q.13. Site of formation of ribosomal precursor/ribosomal subunits in the cell is

- A) nucleus
- B) nucleolus
- C) Golgi body
- D) stroma

Answer: nucleolus

Solution: Eukaryotic cells contain 80 S type of ribosome(except mitochondria and chloroplast which contains 70 S ribosome) whereas prokaryotic cells contain 70 S type of ribosome. A ribosome is composed of two subunits: large and small. 80 S is composed of 60 S and 40 S subunits while 70 S is composed of 50 S and 30 S subunits.

The process of making ribosomes is called Ribosome biogenesis. This process is a very tightly regulated process and is closely associated with other cellular activities like growth and division. This process takes place in the cytoplasm In prokaryotes while In eukaryotes, it takes place both in the cytoplasm and in the nucleolus. It involves the synthesis and processing of the rRNA, and also the assembly of those rRNA with the ribosomal proteins. Thus, the site of formation of ribosomal precursor/ribosomal subunits in a eukaryotic cell is the nucleolus.

Q.14. Which organelle converts cellular polymers into monomers?

- A) Lysosomes.
- B) Golgi bodies.
- C) SER.
- D) Plastids.

Answer: Lysosomes.



Solution: The lysosome is a membrane-bound cell organelle found in many animal cells. They are the spherical vesicles that contain hydrolytic enzymes which can break down many types of biomolecules. The pH of the lumen (~4.5–5.0) is optimal for the enzymes involved in the process of hydrolysis, analogous to the activity of the stomach. Besides the degradation of polymers, the lysosome is involved in various cellular processes, including secretion, plasma membrane repair, apoptosis, cell signalling, and energy metabolism. It is a polymeric cell organelle. It arises by GERL system (Golgi-Endoplasmic Reticulum-Lysosome).

Lysosomes digest materials that are taken into the cell and recycle the intracellular materials. The lysosomes act as a waste disposal system of cells by digesting in use materials in the cytoplasm, from both inside and outside the cell. Material from outside the cell is taken-up through the process of endocytosis, while materials from the inside of the cell are digested by autophagy. Lysosomes are called suicidal bags as when the cell gets damaged, the lysosome may burst, and the hydrolytic enzymes in it can digest the cell itself.

Lysosomes are known to contain more than sixty different enzymes and have more than 50 membrane proteins. Enzymes of lysosomes are synthesised in the rough endoplasmic reticulum (RER) and exported to the Golgi apparatus upon recruitment by a complex composed of proteins. The enzymes are trafficked from the Golgi body to lysosomes in small vesicles, which then fuse with larger acidic vesicles.

Lysosomes should not be confused with liposomes or with micelles. Lysosomes contain a variety of enzymes which enables the cell to break down various biomolecules that it engulfs which includes peptides, nucleic acids, carbohydrates, and lipids. The enzymes responsible for this hydrolysis require an acidic environment for their optimal activity. In addition to being able to break down the polymers, lysosomes are also capable of fusing with other organelles & digesting large structures or cellular debris; through cooperation with phagosomes, they can conduct autophagy, clearing out damaged structures. Similarly, they can break-down virus particles or bacteria in the phagocytosis of macrophages.

Q.15. 70 S type of ribosomes are found in:

- A) Prokaryotic cells
- B) Eukaryotic cells
- C) Mitochondria
- D) All of these

Answer: All of these

Solution: Prokaryotes contain 70S ribosomes, each consisting of a small 30S and a large 50S subunit. Eukaryotic cells have 80 S type of ribosome (except mitochondria and chloroplast) 80 S is composed of 60 S and 40 S subunits. Mitochondria and chloroplast of a eukaryotic cell contain 70 S ribosome, these are endosymbiotic cell organelle.

Q.16. Match column I with column II and select the correct option from the codes given below.

	Column I		Column I
A	Mitochondria	(i)	Without membrane
B	Lysosomes	(ii)	Single membrane
C	Ribosomes	(iii)	Double membrane
D	Nucleus		

- A) A B C D
(i) (ii) (iii) (iii)
- B) A B C D
(iii) (i) (i) (ii)
- C) A B C D
(iii) (ii) (i) (iii)
- D) A B C D
(ii) (iii) (i) (iii)

Answer: A B C D
(iii) (ii) (i) (iii)



Solution: The mitochondria are a double-membraned, semiautonomous cell organelle primarily found in eukaryotic cells. It is the seat of energy generation and is often referred to as the powerhouse of the cell. A lysosome is a single membrane-bound organelle found in animal cells. They are spherical vesicles that contain hydrolytic enzymes (lipases, proteases, carbohydrases) that can digest various types of biomolecules such as carbohydrates, proteins, lipids, and nucleic acids. A ribosome is a cell organelle without any membrane, whose main function is the synthesis of proteins. Ribosomes are composed of proteins and nucleic acids. They are found either free in the cytoplasm or attached to the endoplasmic reticulum to form a rough endoplasmic reticulum. This cell organelle is present in both prokaryotic and eukaryotic cells. The nucleus is the largest extra-cytoplasmic component of the cell that controls morphology, function, and heredity. It is found in all eukaryotic cells except in mature mammalian erythrocytes and mature sieve tubes of higher plants. It is surrounded by a double phospholipid bilayer.

Q.17. If a living cell is placed under anaerobic condition its.

- A) Mitochondria will multiply
- B) Mitochondria will disappear
- C) ER will disappear
- D) Mitochondria and ribosomes multiply speedily

Answer: Mitochondria will disappear

Solution: All living cells carry out cellular respiration to survive. It can be aerobic or anaerobic respiration. Aerobic respiration occurs in mitochondria through a complex process of ATP formation using ETS. Whereas anaerobic respiration takes place in cytoplasm and Mitochondria doesn't play any role in anaerobic respiration. So, mitochondria will die if a living cell is placed in anaerobic conditions.

Q.18. The only organelle found in *PPLO* is

- A) nucleus
- B) ribosomes
- C) plastids
- D) vacuoles

Answer: ribosomes

Solution: *Mycoplasma* also called *PPLO* (Pleuro pneumonia-like organisms) are bacterial genus that lacks a cell wall around their cell membranes and is resistant to antibiotics that target cell wall synthesis.

Bacteria are prokaryotic organisms that lack membrane-bound nuclei, and organelles; DNA forms a tangled structure known as a nucleoid, but there is no membrane around the nucleoid.

Q.19. The correct order of relative size in the following is

- A) nucleus > cell > chromosomes > oxygen atom and water molecule
- B) cell > nucleus > water molecule oxygen atom > chromosome
- C) chromosome > cell > nucleus > water molecule and oxygen atom
- D) cell > nucleus > chromosome > water molecule and oxygen atom

Answer: cell > nucleus > chromosome > water molecule and oxygen atom



Solution: Typically, an RBC is nearly 7.0 micron in diameter.

A typical interphase nucleus is 5-12 μm in diameter.

Since the nucleus contains one or more chromosomes, so the size of the chromosome will be obviously smaller than the nucleus.

Water molecule is much smaller than chromosomes, which has DNA and histone proteins in eukaryotic cells.

Oxygen atom is the smallest among the given items.

Q.20. In fluid mosaic model of plasma membrane:

- A) Upper layer is non-polar and hydrophilic
- B) Polar layer is hydrophobic
- C) Phospholipids form a bimolecular layer in middle part
- D) Proteins form middle layer

Answer: Phospholipids form a bimolecular layer in middle part

Solution: The fluid mosaic model was given by Singer and Nicolson in the year 1972. As per this model, lipids' quasi-fluid nature allows for the possible lateral movement of proteins within the overall bilayer. This tendency to move within the membrane is measured as its fluidity.

The plasma membrane is made up of lipids placed in a bilayer and within the membrane, with the polar head towards the outer sides and the hydrophilic tails lying towards the inner part of the membrane. Due to this, the nonpolar tail of saturated hydrocarbons remains protected from the aqueous environment.

The plasma membrane is composed of 52% protein and 40% lipids. Peripheral proteins lie on the membrane's outer surface while the integral proteins are partially or buried in the membrane.

Q.21. Golgi complex is specialized for

- A) energy transduction
- B) glycosidation of lipids
- C) digestion
- D) sphaerosome formation

Answer: glycosidation of lipids

Solution: Golgi complex is also known as Dictyosomes in plants. These are net-like flat structures which are responsible for the packaging of proteins and glycosylation and glycosidation of proteins and lipids. All the major components such as pectin, hemicellulose, proteins and microfibrils of cellulose which are required for the formation of cell wall are secreted by Golgi body. It also helps in the formation of lysosomes.

Q.22. Mitochondria are associated with all of the following functions, EXCEPT :

- A) ATP synthesis
- B) DNA synthesis
- C) Protein synthesis
- D) Protein glycosylation

Answer: Protein glycosylation



Solution: The mitochondria are the double-membraned organelles, and it is the site of aerobic respiration. The most important function of mitochondria is the production of ATP. The production of ATP takes place through the process of oxidative phosphorylation. The mitochondrial matrix houses the enzymes for the pyruvate decarboxylation and kreb's cycle.

Mitochondria is a semi-autonomous organelle as it possesses single circular DNA molecule. The 70 S ribosomes are also present in mitochondria which helps in the synthesis of protein in mitochondria.

The protein glycosylation is the process of addition of oligosaccharide to the protein molecule which takes place in endoplasmic reticulum.

Q.23. Stroma in the chloroplasts of higher plant contains

- A) Chlorophyll
- B) Light-independent reaction enzymes
- C) Light-dependent reaction enzymes
- D) Ribosomes

Answer: Light-independent reaction enzymes

Solution: The process of photosynthesis is carried in a certain type of plastids called **chloroplasts**. They are:

1. Semi-autonomous organelles
2. With double membrane bound structures
3. With their own single, naked, circular, dsDNA, some 70S ribosomes and RNA.
4. With a matrix called the stroma.
5. With some sac-like structures present in the stroma, called grana which has lamellar thylakoids.
6. Pigments like chlorophyll, carotenoids, are present in the thylakoid.
7. The stroma is the site for the light-independent reactions or the Calvin cycle.
8. In the grana, photochemical reactions take place.

Q.24. Read the following statements for the endomembrane system and state them as true (T) or false (F).

- A. In the animal cells, lipid-like steroidal hormones are synthesized in SER.
- B. The convex or trans face of the Golgi apparatus is a maturing face from which the lysosomes arise.
- C. The membrane of lysosomes has an active H^+ pump mechanism that maintains acidic pH in the lumen of the lysosomes.
- D. The contractile vacuole of the *Amoeba* helps in osmoregulation and excretion.

- A) (A – T), (B – F), (C – T), (D – T)
- B) (A – T), (B – T), (C – T), (D – T)
- C) (A – T), (B – F), (C – F), (D – F)
- D) (A – F), (B – T), (C – F), (D – F)

Answer: (A – T), (B – F), (C – T), (D – T)

Solution: The smooth endoplasmic reticulum (SER) is mainly associated with the synthesis of lipids. In animal cells, lipid-like steroidal hormones are synthesized in the smooth endoplasmic reticulum.

The contractile vacuole is found in some protists like *Amoeba*, *Paramecium* and *Chlamydomonas*. It performs osmoregulation and excretion. A contractile vacuole is an analogous organ to the liver. Golgi complex consists of many flat, disc-shaped sacs or cisternae, that are concentrically arranged near the nucleus. Cisternae show asymmetry and two polar faces. Concave or distal or maturing trans face is near the cell membrane and cis or convex or proximal or forming face is towards RER and nuclear membrane. The cis and the trans face of the Golgi complex are entirely different but interconnected. The isolated lysosomal vesicles are very rich in almost all types of hydrolytic enzymes (lipases, proteases, carbohydrases). They get activated in the acidic medium. These enzymes are capable of digesting proteins, lipids, carbohydrates and nucleic acids. Acidic conditions are maintained inside the lysosomes by pumping of protons into them.



Q.25. P and Q are the major sites for the synthesis of _____ and _____ respectively.

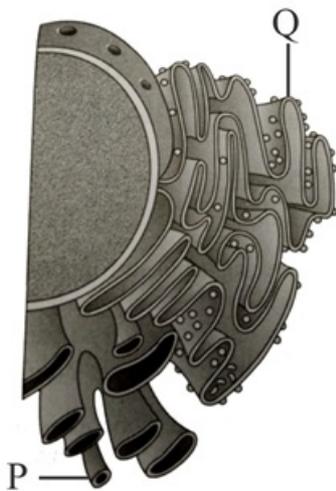


- A) proteins, lipids
- B) lipids, proteins
- C) carbohydrates, lipids
- D) vitamins, proteins

Answer: lipids, proteins

Solution: **Endoplasmic reticulum is of two types** based on presence and absence of ribosomes- (i) Smooth Endoplasmic Reticulum (ii) Rough Endoplasmic Reticulum.

Rough Endoplasmic Reticulum-It is connected with nuclear envelope. Rough endoplasmic reticulum possesses ribophorins which are meant for holding ribosomes over it. RER forms extensive network around the nucleus as well as in the cytoplasm. Its components are cisternae, vesicles and tubules. **Rough endoplasmic reticulum (Q) are the main sites for the synthesis of proteins because it has ribosomes on its surface.**



Smooth Endoplasmic Reticulum is produced from RER through the loss/removal of protein-synthesising ribosomes. SER is mainly made up of tubules and vesicles. **Smooth endoplasmic reticulum (P) has no ribosomes on its surface, these are the main sites for the synthesis of lipids.**

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