

Cell: The Unit of Life — NEET MCQs with Solutions

Class 11 Biology · 24 free questions · 531 questions in the RankUpp app

Q1. The Latin phrase 'Omnis cellula e cellula' means "every cell from a cell" and was stated by:

- (A) Matthias Schleiden
- (B) Rudolf Virchow
- (C) Theodor Schwann
- (D) Robert Brown

Q2. While studying plant cells, which scientist first recognized the importance of the nucleus and communicated this to Schwann?

- (A) Rudolf Virchow
- (B) Matthias Schleiden
- (C) Robert Brown
- (D) Antonie van Leeuwenhoek

Q3. Which of the following correctly represents the chronological sequence of major contributions to cell theory?

- (A) Hooke → Virchow → Schleiden and Schwann
- (B) Leeuwenhoek → Hooke → Schleiden and Schwann → Virchow
- (C) Hooke → Leeuwenhoek → Schleiden and Schwann → Virchow
- (D) Schleiden and Schwann → Hooke → Leeuwenhoek → Virchow

Q4. Plasmids are best described as:

- (A) Membrane-bound DNA organelles
- (B) Circular extrachromosomal DNA
- (C) Linear chromosomal DNA
- (D) Ribosomal RNA molecules

Q5. The glycocalyx forms the outermost layer in many bacteria. Which of the following correctly distinguishes its two forms?

- (A) Capsule is loosely attached; slime layer is firmly bound
- (B) Both capsule and slime layer are chemically identical and interchangeable
- (C) Capsule is firmly attached to cell wall; slime layer is loosely associated
- (D) Slime layer provides more protection than capsule against phagocytosis

Q6. Prokaryotic flagella differ from eukaryotic flagella primarily in:

- (A) Lacking the 9+2 microtubule arrangement
- (B) Being composed of tubulin protein
- (C) Being membrane-bound structures
- (D) Having a more complex basal body than eukaryotes

Q7. Which of the following best explains why eukaryotic cells are generally larger and more complex than prokaryotic cells?

- (A) They lack ribosomes, allowing more cytoplasmic space
- (B) They have circular DNA which allows faster replication
- (C) They lack a cell wall, permitting greater expansion
- (D) They possess membrane-bound organelles enabling division of labour and metabolic compartmentalisation

Q8. In prokaryotes, DNA is:

- (A) Naked and circular
- (B) Linear and histone-bound
- (C) Double-stranded and enclosed in nucleus
- (D) Circular and associated with basic proteins like histones

Q9. The uptake of solid particles by a cell through membrane engulfment is specifically called:

- (A) Pinocytosis
- (B) Receptor-mediated endocytosis
- (C) Exocytosis
- (D) Phagocytosis

Q10. Glycoproteins on the outer surface of the plasma membrane are essential for:

- (A) Transcription of nuclear DNA
- (B) Synthesis of membrane phospholipids
- (C) Cell-cell recognition and immune response
- (D) Division of the inner mitochondrial membrane

Q11. The plasma membrane is described as 'dynamic' because:

- (A) Its lipid components are covalently fixed to cytoskeletal proteins
- (B) All membrane proteins are permanently embedded and immobile
- (C) The membrane undergoes complete renewal every 24 hours
- (D) Lipids and many proteins can move laterally within the bilayer

Q12. Cholesterol in animal cell membranes primarily:

- (A) Forms the rigid structural framework replacing phospholipids
- (B) Regulates membrane fluidity by intercalating between phospholipids
- (C) Functions as a membrane-bound enzyme for lipid metabolism
- (D) Serves as the genetic storage molecule of the membrane

Q13. Mitochondria are referred to as the 'powerhouse of the cell' because they:

- (A) Produce ATP through aerobic cellular respiration, providing energy currency for virtually all cellular processes
- (B) Store glucose and release it during times of high energy demand
- (C) Contain the highest concentration of enzymes of any organelle, enabling rapid metabolic reactions
- (D) Generate electrical potential across the plasma membrane used to power ion pumps

Q14. The mature plant cell has a large central vacuole that may occupy what proportion of the cell's volume?

- (A) 5–10%
- (B) 15–25%
- (C) 30–40%
- (D) Up to 90%

Q15. Which of the following is the correct set of acid hydrolases found in lysosomes?

- (A) ATPase, DNA polymerase, RNA primase, and topoisomerase
- (B) Amylase, pepsin, trypsin, and lipase (digestive enzymes of the alimentary canal)
- (C) Lipases, proteases, carbohydrases, and nucleases (all active at acidic pH)
- (D) Catalase, peroxidase, superoxide dismutase, and oxidase

Q16. Formation of primary lysosomes in animal cells primarily involves which organelle?

- (A) Golgi apparatus, which packages hydrolytic enzymes into vesicles
- (B) Plasma membrane, through endocytosis of external hydrolases
- (C) Nucleus, by directing enzyme synthesis directly to vesicles
- (D) Mitochondria, using inner membrane budding

Q17. The sedimentation coefficient of the eukaryotic ribosome and its subunits are:

- (A) 70S (50S + 30S)
- (B) 80S (60S + 40S)
- (C) 80S (50S + 30S)
- (D) 70S (60S + 40S)

Q18. The RER appears rough due to the presence of:

- (A) Ribosomes on its cytoplasmic surface
- (B) Cholesterol microdomains
- (C) Double-stranded DNA strands
- (D) Polymerized microtubule bundles

Q19. Ribosomes present in chloroplasts of eukaryotic plant cells are:

- (A) 80S, identical to cytoplasmic ribosomes, indicating nuclear genetic control of chloroplast function
- (B) 70S, supporting the endosymbiotic origin of chloroplasts from cyanobacterial ancestors
- (C) 60S only, as the small subunit is encoded by nuclear DNA and not assembled in the chloroplast
- (D) 70S in young chloroplasts but convert to 80S in mature chloroplasts

Q20. Proteins synthesized on RER ribosomes are transported to the Golgi apparatus via:

- (A) Simple diffusion through the cytoplasm
- (B) Nuclear pores that connect ER to Golgi
- (C) Cytoskeletal filaments that directly transfer proteins
- (D) Membrane-bound transport vesicles that bud from ER and fuse with cis-Golgi

Q21. A chromatid is best defined as:

- (A) A complete haploid genome
- (B) A single nucleosome repeat unit
- (C) A 30 nm fibre segment
- (D) One of the two identical copies of a replicated chromosome joined at the centromere

Q22. Which of the following cells is correctly identified as anucleate in its mature functional state?

- (A) Neurons, due to post-mitotic arrest
- (B) Osteocytes, embedded in bone matrix
- (C) Guard cells, which require rapid response
- (D) Mature mammalian erythrocytes

Q23. Sieve tube elements in phloem are characterised by:

- (A) Absence of nucleus at maturity, yet remaining living cells
- (B) Presence of a large central vacuole and active nucleus
- (C) Complete absence of all organelles including mitochondria
- (D) Presence of centrioles for phloem fibre formation

Q24. Euchromatin, compared to heterochromatin, is characterised by being:

- (A) Darkly stained, gene-poor, and transcriptionally silent
- (B) Lightly stained, gene-rich, and transcriptionally active
- (C) Exclusively located at the nuclear periphery
- (D) Composed entirely of repetitive non-coding sequences

Answer key and explanations

Q1. Answer: (B) Rudolf Virchow

Virchow (1855) coined this phrase to express that cells only arise from pre-existing cells. Schleiden and Schwann proposed the structural unity of organisms but did not address cell origin. Brown discovered the nucleus.

Q2. Answer: (B) Matthias Schleiden

Schleiden observed and emphasized the role of the nucleus in plant cells, and this observation influenced Schwann when they met. Robert Brown had earlier described the nucleus, but it was Schleiden's communication to Schwann that contributed to cell theory development — a frequent NEET confusion point.

Q3. Answer: (C) Hooke → Leeuwenhoek → Schleiden and Schwann → Virchow

Hooke (1665) coined 'cell'; Leeuwenhoek (~1674) observed living cells; Schleiden (1838) and Schwann (1839) proposed cell theory; Virchow (1855) added cell lineage. Any other order misplaces a key contributor and is factually wrong.

Q4. Answer: (B) Circular extrachromosomal DNA

Plasmids are small, circular, self-replicating DNA molecules found outside the main chromosome in bacteria. They are extrachromosomal and not membrane-bound. Option A is wrong because plasmids have no membrane. Option C describes eukaryotic nuclear DNA.

Q5. Answer: (C) Capsule is firmly attached to cell wall; slime layer is loosely associated

Capsule is firmly attached to the cell wall and provides stronger protection against host defenses including phagocytosis. The slime layer is loosely associated. Option A reverses this distinction — the most common exam trap on this concept.

Q6. Answer: (A) Lacking the 9+2 microtubule arrangement

Prokaryotic flagella are made of flagellin protein and lack the 9+2 axonemal arrangement seen in eukaryotic cilia/flagella. Option B is the key trap — tubulin is the eukaryotic flagella protein; prokaryotic flagella use flagellin.

Q7. Answer: (D) They possess membrane-bound organelles enabling division of labour and metabolic compartmentalisation

Membrane-bound organelles in eukaryotes create specialised compartments for specific functions — this division of labour supports greater size and complexity. Options A and B are factually false; Option C is incorrect as many eukaryotes do have cell walls.

Q8. Answer: (A) Naked and circular

Prokaryotic DNA is circular, double-stranded, and not associated with histone proteins — it is "naked." Option D is the key trap: prokaryotic DNA does associate with histone-like proteins (HU, H-NS) but NOT true histones — NCERT explicitly states no histones in prokaryotes.

Q9. Answer: (D) Phagocytosis

Phagocytosis ('cell eating') involves engulfment of solid particles (bacteria, debris) via pseudopodia. Pinocytosis (Option A) is 'cell drinking' — uptake of liquid droplets. Receptor-mediated endocytosis (Option B) is selective uptake via specific receptors. Exocytosis (Option C) is the reverse process.

Q10. Answer: (C) Cell-cell recognition and immune response

Glycoproteins on the extracellular face form the glycocalyx and mediate cell-cell recognition, tissue formation, and immune recognition (e.g., blood group antigens, MHC molecules). They are not involved in DNA transcription or phospholipid synthesis.

Q11. Answer: (D) Lipids and many proteins can move laterally within the bilayer

The dynamic nature refers to the lateral mobility of phospholipids and many membrane proteins within the bilayer, as established by the fluid mosaic model. The FRAP (fluorescence recovery after photobleaching) experiment demonstrated this mobility. Not all proteins are mobile — some are anchored to the cytoskeleton.

Q12. Answer: (B) Regulates membrane fluidity by intercalating between phospholipids

Cholesterol tucks between phospholipid tails and modulates fluidity — it prevents excessive fluidity at high temperatures and excessive rigidity at low temperatures. It does not replace phospholipids (Option A) or store genetic material (Option D).

Q13. Answer: (A) Produce ATP through aerobic cellular respiration, providing energy currency for virtually all cellular processes

Mitochondria carry out aerobic respiration — oxidative phosphorylation via the electron transport chain and ATP synthase produces the bulk of cellular ATP. The proton gradient across the inner mitochondrial membrane drives ATP synthesis via F_0F_1 ATP synthase.

Q14. Answer: (D) Up to 90%

NCERT states the central vacuole in mature plant cells can occupy up to 90% of the cell volume, pushing the cytoplasm and organelles to a thin peripheral layer. This is a direct NCERT factual point frequently tested.

Q15. Answer: (C) Lipases, proteases, carbohydrases, and nucleases (all active at acidic pH)

Lysosomes contain acid hydrolases — lipases, proteases, carbohydrases (glycosidases), and nucleases — all optimally active at pH ~4.5–5. Option B is the ELITE trap: these are digestive enzymes but are secreted into the gut lumen, not lysosomal enzymes.

Q16. Answer: (A) Golgi apparatus, which packages hydrolytic enzymes into vesicles

Primary lysosomes form when the Golgi packages acid hydrolases (synthesized on RER) into membrane vesicles. The enzymes arrive at Golgi via RER → transport vesicle route, and Golgi buds off the primary lysosome.

Q17. Answer: (B) 80S (60S + 40S)

Eukaryotic ribosomes are 80S, composed of a large 60S and small 40S subunit. Prokaryotic ribosomes are 70S (50S + 30S). Options C and D mix up subunit sizes between the two types — a classic NEET numerical trap.

Q18. Answer: (A) Ribosomes on its cytoplasmic surface

Ribosomes studded on the cytoplasmic face of RER membranes give it its characteristic rough appearance. These ribosomes are the site of synthesis of proteins destined for secretion or membrane insertion.

Q19. Answer: (B) 70S, supporting the endosymbiotic origin of chloroplasts from cyanobacterial ancestors

Chloroplast ribosomes are 70S (30S + 50S subunits), like prokaryotic ribosomes — consistent with the endosymbiotic theory that chloroplasts evolved from ancient cyanobacteria. Option A is the trap for students who overgeneralize "eukaryote = 80S."

Q20. Answer: (D) Membrane-bound transport vesicles that bud from ER and fuse with cis-Golgi

Transport vesicles (COPII-coated) bud from the ER and fuse with the cis face of Golgi. Option C is a trap — cytoskeleton guides vesicle movement but does not itself transfer proteins.

Q21. Answer: (D) One of the two identical copies of a replicated chromosome joined at the centromere

After DNA replication, each chromosome consists of two sister chromatids joined at the centromere. Option B (haploid genome) confuses chromatid with chromosome set — a common conceptual error in NEET.

Q22. Answer: (D) Mature mammalian erythrocytes

Mature mammalian RBCs eject their nucleus during maturation to maximise haemoglobin-carrying capacity. Neurons, osteocytes, and guard cells all retain their nucleus. Option A (neurons) is the most common NEET trap — they are post-mitotic but not anucleate.

Q23. Answer: (A) Absence of nucleus at maturity, yet remaining living cells

Mature sieve tube elements lose their nucleus (and tonoplast, ribosomes) yet remain alive — metabolically supported by companion cells. Option C is wrong because mitochondria and some ER persist. This is an elite NCERT trap: living but anucleate.

Q24. Answer: (B) Lightly stained, gene-rich, and transcriptionally active

Euchromatin is loosely packed, stains lightly, and contains actively transcribed genes. Option A describes heterochromatin. Option C is partially true for constitutive heterochromatin, not euchromatin — a common NEET trap.

Cell facts to remember

Topic	Key fact
Cell theory	Schleiden (1838) and Schwann (1839); Rudolf Virchow (1855): <i>omnis cellula-e cellula</i>
First live cell seen	Anton von Leeuwenhoek; Robert Brown later discovered the nucleus
Cell sizes	Mycoplasma about 0.3 μm (smallest); bacteria 3–5 μm ; ostrich egg is the largest isolated single cell
Prokaryotic cell	No membrane-bound organelles; naked circular DNA; plasmids; 70S ribosomes; mesosomes
Glycocalyx	Capsule (tough, firmly attached) or slime layer (loose)
Fluid mosaic model	Singer and Nicolson (1972); lipids and proteins move laterally
Golgi apparatus	Camillo Golgi (1898); cis (forming) and trans (maturing) faces; forms glycoproteins and glycolipids
Lysosomes	Formed by the Golgi; acid hydrolases — lipases, proteases, carbohydrases, nucleases
Vacuole	Up to 90% of a plant cell's volume; bounded by the tonoplast
Mitochondria	Double membrane; cristae; matrix with circular DNA and 70S ribosomes; site of aerobic respiration
Plastids	Chloroplasts, chromoplasts, leucoplasts (amyloplasts, elaioplasts, aleuroplasts)
Ribosomes	Discovered by George Palade (1953); eukaryotic 80S (60S + 40S), prokaryotic 70S (50S + 30S)
Cilia and flagella	9 + 2 arrangement of microtubules in the axoneme
Centrioles	Cartwheel of nine triplet microtubules
Chromosomes by centromere	Metacentric, sub-metacentric, acrocentric, telocentric