

Biomolecules — NEET MCQs with Solutions

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Q1. Which of the following is a micromolecule likely to be found in the acid-soluble pool of living tissue homogenate?

- (A) DNA
- (B) Glucose
- (C) Cellulose
- (D) Haemoglobin

Q2. After igniting a piece of living tissue completely, the ash residue represents which component of the original tissue?

- (A) Degraded proteins
- (B) Structural polysaccharides
- (C) Carbon-containing organic framework
- (D) Inorganic mineral elements

Q3. Which element is most abundant by mass in living organisms?

- (A) Carbon
- (B) Nitrogen
- (C) Oxygen
- (D) Phosphorus

Q4. A plant compound functions in herbivore defence and has no direct role in the plant's growth or reproduction. It is best categorised as:

- (A) A primary metabolite essential for anabolic pathways
- (B) A carbohydrate used in central energy metabolism
- (C) A secondary metabolite with ecological significance
- (D) A nucleic acid component involved in gene expression

Q5. A compound isolated from opium poppy shows analgesic properties and contains nitrogen. It is most likely classified as:

- (A) A primary metabolite essential for cellular respiration
- (B) An alkaloid secondary metabolite
- (C) An organic acid involved in the TCA cycle
- (D) A sugar derivative used in glycolysis

Q6. Which of the following processes is exclusively associated with primary metabolites and cannot involve secondary metabolites?

- (A) Plant defence against herbivores
- (B) Glycolysis
- (C) Pigmentation in flower petals
- (D) Antibiotic production in fungi

Q7. Which bond joins monosaccharide units in polysaccharides?

- (A) Peptide bond
- (B) Disulfide bond
- (C) Phosphodiester bond
- (D) Glycosidic bond

Q8. Which level of protein structure is directly stabilized by disulfide bonds between cysteine residues?

- (A) Primary
- (B) Secondary
- (C) Tertiary
- (D) Quaternary

Q9. Which of the following correctly distinguishes deoxyribose from ribose in nucleic acids?

- (A) Deoxyribose has an extra hydroxyl at the 2' carbon
- (B) Deoxyribose lacks the hydroxyl group at the 2' carbon, having H instead
- (C) Ribose lacks oxygen at the 3' carbon
- (D) Both sugars are chemically identical in nucleic acids

Q10. Which structural level of protein organisation refers to the linear sequence of amino acids joined by peptide bonds?

- (A) Secondary
- (B) Primary
- (C) Tertiary
- (D) Quaternary

Q11. Hydrolysis of peptide bonds in a protein directly disrupts which level of structure?

- (A) Secondary
- (B) Tertiary
- (C) Primary
- (D) Quaternary

Q12. Which factor would most specifically disrupt ionic interactions in a protein without primarily targeting other bond types?

- (A) Moderate temperature increase
- (B) Low light exposure
- (C) Increased glucose concentration
- (D) Extreme pH change

Q13. Which of the following sugars is a pentose?

- (A) Glucose
- (B) Fructose
- (C) Galactose
- (D) Ribose

Q14. Which polysaccharide is composed of N-acetylglucosamine units linked by β -1,4 glycosidic bonds?

- (A) Cellulose
- (B) Starch
- (C) Chitin
- (D) Glycogen

Q15. Which change would convert a reducing disaccharide into a non-reducing one?

- (A) Involvement of the free anomeric carbon in a new glycosidic bond
- (B) Breakage of existing peptide bonds
- (C) Addition of a phosphate group to the backbone
- (D) Conversion of the disaccharide into a polysaccharide

Q16. A long-chain fatty acid esterified with a long-chain monohydric alcohol is classified as:

- (A) Steroid
- (B) Phospholipid
- (C) Triglyceride
- (D) Wax

Q17. In aqueous solution, a phospholipid molecule orients itself such that:

- (A) Hydrophobic heads project toward water
- (B) Hydrophilic tails cluster away from water
- (C) Both heads and tails face the aqueous phase equally
- (D) Polar phosphate heads face water and nonpolar fatty acid tails face away from water

Q18. Which of the following best explains why trans unsaturated fatty acids raise melting point more than cis unsaturated fatty acids?

- (A) Trans bonds introduce more kinks than cis bonds
- (B) Trans configuration keeps chains straighter, allowing tighter packing similar to saturated fatty acids
- (C) Trans fatty acids have more double bonds than cis
- (D) Trans bonds convert fatty acids to steroids

Q19. Which sugar is present in RNA?

- (A) Deoxyribose
- (B) Ribose
- (C) Glucose
- (D) Fructose

Q20. Which of the following is responsible for maintaining the complementarity between the two strands of DNA?

- (A) Covalent bonds between sugar and phosphate
- (B) Hydrogen bonds between specific purine-pyrimidine base pairs
- (C) Peptide bonds linking the bases
- (D) Disulfide bridges between complementary strands

Q21. Which of the following sequences of events correctly represents the components assembling into a nucleotide?

- (A) Base + Sugar → Nucleoside → + Phosphate → Nucleotide
- (B) Phosphate + Sugar → + Base → Nucleotide
- (C) Base + Phosphate → + Sugar → Nucleotide
- (D) Sugar alone → Nucleotide

Q22. Which of the following correctly classifies enzymes that catalyse oxidation-reduction reactions?

- (A) Oxidoreductases
- (B) Lyases
- (C) Ligases
- (D) Transferases

Q23. Enzyme-substrate complex formation is essential because it:

- (A) Permanently changes the equilibrium constant of the reaction
- (B) Provides chemical energy from the enzyme to the substrate
- (C) Brings reactants into correct orientation, lowering activation energy
- (D) Prevents product release, maintaining substrate binding

Q24. Which of the following correctly explains the high substrate specificity of enzymes?

- (A) Active site has a precise 3D arrangement of amino acid residues complementary to the substrate
- (B) Enzymes form permanent covalent bonds with their substrates
- (C) Substrates modify enzyme structure before binding
- (D) All enzymes have identical active sites ensuring universal specificity

Answer key and explanations

Q1. Answer: (B) Glucose

Glucose is a small molecule (MW ~180 Da) that passes through the filter into the acid-soluble fraction. DNA, cellulose, and haemoglobin are all macromolecules retained in the acid-insoluble fraction.

Q2. Answer: (D) Inorganic mineral elements

Complete combustion destroys all organic matter (C, H, O, N exit as CO_2 , H_2O , N_2). What remains is inorganic ash — mineral elements like Ca, Mg, K, Na, Fe, Zn, Mn — confirming the inorganic elemental content of living tissue.

Q3. Answer: (C) Oxygen

Oxygen is the most abundant element by mass in living organisms because water (H_2O) alone constitutes 70–90% of cell mass, and oxygen is 89% of water's mass. This is a classic NEET trap — most students incorrectly select carbon, assuming it dominates organic molecules.

Q4. Answer: (C) A secondary metabolite with ecological significance

Compounds not required for growth/reproduction but serving ecological roles — such as herbivore deterrence — are definitively secondary metabolites. Options A, B, and D all describe categories of primary metabolites.

Q5. Answer: (B) An alkaloid secondary metabolite

Morphine-type compounds are nitrogen-containing alkaloids — secondary metabolites with pharmacological activity but no role in the producer's own primary metabolism. Options A, C, and D all describe primary metabolite categories, not alkaloids.

Q6. Answer: (B) Glycolysis

Glycolysis involves exclusively primary metabolites — glucose, pyruvate, ATP, NAD^+ — and is a universal energy-generating pathway. Defence (Option A), petal pigmentation (Option C), and antibiotic production (Option D) all involve secondary metabolites.

Q7. Answer: (D) Glycosidic bond

Glycosidic bonds are formed between the anomeric carbon of one sugar and a hydroxyl group of another, with loss of water. Peptide bonds link amino acids; phosphodiester bonds link nucleotides; disulfide bonds link cysteine residues in proteins.

Q8. Answer: (C) Tertiary

Disulfide bonds are covalent linkages between sulfhydryl groups of cysteine residues, stabilizing tertiary structure by holding distant parts of the polypeptide chain together. Secondary structure is maintained by hydrogen bonds between backbone atoms; primary structure is held by peptide bonds.

Q9. Answer: (B) Deoxyribose lacks the hydroxyl group at the 2' carbon, having H instead

Deoxyribose (in DNA) has a hydrogen atom at the 2' carbon where ribose (in RNA) has a hydroxyl ($-\text{OH}$) group. This single difference makes DNA more chemically stable than RNA and is the basis for the "deoxy" prefix.

Q10. Answer: (B) Primary

Primary structure is defined as the specific sequence of amino acids in the polypeptide chain, held together by covalent peptide bonds. All higher structures are dependent on this sequence.

Q11. Answer: (C) Primary

The primary structure IS the sequence of amino acids linked by peptide bonds — breaking them destroys the primary structure. All higher structures collapse as a consequence, but the direct effect is on primary structure.

Q12. Answer: (D) Extreme pH change

Extreme pH alters the ionisation states of acidic and basic R-groups (e.g., $-\text{COO}^-$ and $-\text{NH}_3^+$), directly abolishing the charge-charge (ionic) attractions. Moderate heat primarily disrupts hydrophobic interactions and H-bonds first.

Q13. Answer: (D) Ribose

Ribose contains five carbon atoms and is an aldopentose, critical in RNA structure. Glucose, Fructose, and Galactose are all hexoses.

Q14. Answer: (C) Chitin

Chitin is a homopolysaccharide of N-acetylglucosamine with β -1,4 linkages, forming the exoskeleton of arthropods and fungal cell walls. Cellulose is also β -1,4 linked but uses glucose, not N-acetylglucosamine.

Q15. Answer: (A) Involvement of the free anomeric carbon in a new glycosidic bond

If the free anomeric carbon forms a glycosidic bond, no free carbonyl group remains, abolishing reducing property — exactly as in sucrose. Phosphate addition and polymerisation do not inherently eliminate anomeric freedom.

Q16. Answer: (D) Wax

Waxes are defined as esters of long-chain fatty acids and long-chain monohydric alcohols. They are harder and less reactive than triglycerides and serve protective roles (plant cuticle, ear wax, bee honeycomb).

Q17. Answer: (D) Polar phosphate heads face water and nonpolar fatty acid tails face away from water

The amphipathic nature of phospholipids drives spontaneous orientation: polar heads interact favourably with water via H-bonds while nonpolar tails minimise contact with water by clustering inward.

Q18. Answer: (B) Trans configuration keeps chains straighter, allowing tighter packing similar to saturated fatty acids

Trans double bonds place the two carbon segments on opposite sides, keeping the chain relatively linear — allowing closer packing and higher melting points. Cis bonds place segments on the same side, creating kinks that disrupt packing.

Q19. Answer: (B) Ribose

RNA contains ribose (with 2'-OH group); DNA contains deoxyribose (lacking the 2'-OH). This structural difference makes RNA less stable than DNA.

Q20. Answer: (B) Hydrogen bonds between specific purine-pyrimidine base pairs

Hydrogen bonds (2 for A-T; 3 for G-C) between complementary purine-pyrimidine pairs hold the two strands together. These are non-covalent, making strand separation possible during replication.

Q21. Answer: (A) Base + Sugar → Nucleoside → + Phosphate → Nucleotide

A nucleoside is formed first (base + sugar via glycosidic bond); addition of phosphate group then forms a nucleotide. This stepwise understanding is tested in NEET to trap students who conflate nucleoside and nucleotide assembly.

Q22. Answer: (A) Oxidoreductases

NCERT classifies enzymes into six types; oxidoreductases specifically catalyse oxidation-reduction reactions (e.g., dehydrogenases, oxidases). Lyases remove groups without hydrolysis, ligases join molecules, and transferases transfer functional groups — none involve redox.

Q23. Answer: (C) Brings reactants into correct orientation, lowering activation energy

The ES complex positions the substrate precisely at the active site, reducing activation energy by stabilising the transition state. Enzymes do not alter the equilibrium constant (ΔG of reaction) — they only increase the rate of reaching equilibrium.

Q24. Answer: (A) Active site has a precise 3D arrangement of amino acid residues complementary to the substrate

The specific arrangement of amino acid residues at the active site creates a unique geometric and chemical environment that only accommodates a substrate of complementary shape and charge. Option B is incorrect — enzyme-substrate interactions are typically non-covalent and transient.

Biomolecule facts to remember

Topic	Key fact
Most abundant chemical in living organisms	Water
Acid-soluble pool	Small molecules below about 1000 Da — amino acids, sugars, nucleotides
Acid-insoluble fraction	Proteins, nucleic acids, polysaccharides — and lipids, which form vesicles
Most abundant protein	Collagen in the animal world; RuBisCO in the whole biosphere
Bonds	Peptide bond (amino acids), glycosidic bond (sugars), phosphodiester bond (nucleotides), ester bond (fats)
Protein structure	Primary: amino acid sequence; secondary: α -helix (right-handed); quaternary example: haemoglobin ($2\alpha + 2\beta$)
Starch vs cellulose	Starch forms helices that hold iodine (blue colour); cellulose has no such helices, so gives no colour with iodine
Inulin and chitin	Inulin: polymer of fructose; chitin: complex polysaccharide in arthropod exoskeletons
Fatty acids	Palmitic acid has 16 carbons including the carboxyl carbon; arachidonic acid has 20
Nucleotide	Nitrogen base + pentose sugar + phosphate; purines: adenine, guanine; pyrimidines: cytosine, thymine, uracil
B-DNA	Right-handed double helix; A=T (two hydrogen bonds), G≡C (three); 10 base pairs per turn, pitch 3.4 nm
Enzyme classes	Oxidoreductases, transferases, hydrolases, lyases, isomerases, ligases
Competitive inhibition	Malonate inhibits succinic dehydrogenase
Cofactors	Prosthetic group: haem in peroxidase and catalase; coenzyme: NAD and NADP contain niacin; metal ion: zinc for carboxypeptidase
Secondary metabolites	Alkaloids (morphine, codeine), pigments (carotenoids, anthocyanins), toxins (abrin, ricin), lectins (concanavalin A), drugs (vinblastin, curcumin), rubber and gums