

Unit 8.2. MCQs Set 1

Results



#1. Q1. Which of the following best describes how atoms bond to form biological molecules?

- (A). Strictly ionic bonds are used
- (B). Covalent bonds, plus hydrogen bonds, Van der Waals, and hydrophobic interactions
- (C). Only metallic bonds exist in cells
- (D). Molecules in biology rarely form bonds

Biomolecules rely on strong covalent bonds for their backbone, while non-covalent interactions (hydrogen bonds, Van der Waals forces, and hydrophobic interactions) determine structure and function.

#2. Q2. Stereochemistry is crucial in biological systems because:

- (A). Most biomolecules are achiral
- (B). Mirror-image isomers usually have identical biological activity
- (C). The 3D arrangement can significantly alter biological activity
- (D). It matters only for inorganic compounds

The three-dimensional arrangement (chirality) of biomolecules often determines their interactions with enzymes and receptors, dramatically affecting biological activity.

#3. Q3. In carbohydrate metabolism, which pathway breaks down glucose into pyruvate and yields ATP and NADH?

- (A). Gluconeogenesis
- (B). Glycolysis
- (C). Pentose phosphate pathway
-



(D). Urea cycle

Glycolysis converts glucose into pyruvate while generating a net gain of 2 ATP and 2 NADH molecules.

#4. Q4. A defect in the enzyme glucose-6-phosphatase leads to which glycogen storage disease?

- (A). Von Gierke's disease (Type I)
- (B). Pompe disease (Type II)
- (C). McArdle's disease (Type V)
- (D). Hers disease (Type VI)

Glucose-6-phosphatase deficiency results in Von Gierke's disease, causing severe fasting hypoglycemia.

#5. Q5. Which of the following is NOT a main function of lipids?

- (A). Energy storage in the form of triacylglycerols
- (B). Serving as enzymes for catalytic reactions
- (C). Forming membranes (phospholipids), and acting as signals
- (D). Providing precursors for steroid hormones

Enzymatic activity is typically performed by proteins; lipids serve as energy reserves, structural components of membranes, and hormone precursors.

#6. Q6. Fatty acids with zero double bonds are called:

- (A). Saturated fatty acids
- (B). Unsaturated fatty acids
- (C). Trans fatty acids
- (D). Polyunsaturated fatty acids

Saturated fatty acids are those that have no double bonds, meaning they contain only single bonds between carbon atoms.

#7. Q7. The breakdown of fatty acids to acetyl-CoA is known as:

- (A). Lipogenesis
- (B). β -oxidation
- (C). Glycogenolysis
- (D). None

β -oxidation is the process by which fatty acids are broken down in the mitochondria to produce acetyl-CoA.



#8. Q8. Elevated LDL levels in blood often correlate with:

- (A). Decreased risk of cardiovascular disease
- (B). Increased atherogenic risk and heart disease
- (C). Complete immunity to pathogens
- (D). Zero relationship to any pathology

High levels of LDL cholesterol are associated with an increased risk of atherosclerosis and cardiovascular disease.

#9. Q9. Proteins are polymers composed of:

- (A). Simple sugars
- (B). Nucleotides
- (C). Amino acids linked by peptide bonds
- (D). Fatty acids

Proteins are long chains of amino acids linked by peptide bonds.

#10. Q10. The Ramachandran plot shows allowable:

- (A). Carbohydrate isomerization
- (B). ϕ (phi) and ψ (psi) backbone dihedral angles for amino acid residues
- (C). RBC doping patterns
- (D). All illusions

The Ramachandran plot is used to visualize the sterically allowed regions for backbone dihedral angles in proteins.

#11. Q11. Which secondary structure is stabilized by hydrogen bonds between the carbonyl oxygen and the amide hydrogen four residues apart?

- (A). β -sheet
- (B). α -helix
- (C). Random coil
- (D). None

The α -helix structure is stabilized by intra-chain hydrogen bonds between the backbone atoms spaced four residues apart.

#12. Q12. Quaternary structure means:

- (A). The linear amino acid sequence
- (B). Local folding such as α -helix or β -sheet
- (C). The overall 3D folding of one polypeptide



- (D). The complex formed by multiple polypeptide subunits

Quaternary structure refers to the assembly of multiple polypeptide subunits into one functional protein complex.

#13. Q13. Enzymes primarily function by:

- (A). Increasing the activation energy

(B). Lowering the activation energy to speed up reactions

(C). Being consumed permanently

(D). Serving only as structural components

Enzymes accelerate chemical reactions by lowering the activation energy required for the reaction to proceed.

#14. Q14. In enzyme kinetics, a competitive inhibitor:

- (A). Binds allosterically far from the active site

(B). Binds the active site, competing with the substrate, and increases the apparent K_m

(C). Does not affect K_m but lowers V_{max}

(D). Permanently inactivates the enzyme

Competitive inhibitors resemble the substrate and compete for binding at the active site, which increases the apparent K_m without affecting V_{max} .

#15. Q15. Many coenzymes (NAD⁺, FAD) are derived from:

- (A). Polysaccharides

(B). Vitamins such as niacin (B3) or riboflavin (B2)

(C). Cholesterol

(D). N₂ gas

NAD⁺ is derived from niacin, and FAD is derived from riboflavin.

#16. Q16. A defect in phenylalanine hydroxylase causes:

- (A). Maple syrup urine disease

(B). Phenylketonuria (PKU)

(C). Alkaptonuria

(D). None

Phenylalanine hydroxylase deficiency leads to phenylketonuria, characterized by elevated phenylalanine levels and potential neurological damage.



#17. Q17. Proteomics is:

- (A). Study of RBC doping
- (B). A large-scale study of the entire protein complement (proteome) in a cell or organism
- (C). None
- (D). Study of illusions

Proteomics involves the comprehensive analysis of the proteins expressed by a cell or organism at a given time.

#18. Q18. Heme synthesis occurs partly in the cytosol and partly in mitochondria. A disorder in the porphyrin pathway can cause:

- (A). Scurvy
- (B). Porphyria, leading to photosensitivity or neurological symptoms
- (C). Gouty arthritis
- (D). RBC doping

Porphyrias are a group of disorders resulting from defects in the enzymes of the heme synthesis pathway, leading to the accumulation of porphyrin compounds.

#19. Q19. In nucleic acids, the monomeric units are:

- (A). Amino acids
- (B). Fatty acids
- (C). Nucleotides (each consisting of a base, a sugar, and a phosphate)
- (D). None

Nucleic acids are polymers made up of nucleotides, each containing a nitrogenous base, a sugar (ribose or deoxyribose), and a phosphate group.

#20. Q20. The main difference between DNA and RNA is that RNA typically:

- (A). Uses thymine (T) as a base
- (B). Has deoxyribose sugar
- (C). Is single-stranded and contains uracil (U) instead of thymine (T)
- (D). Cannot form hydrogen bonds

RNA usually is single-stranded and contains uracil instead of thymine, and it has ribose as its sugar, unlike DNA.

#21. Q21. The A-T base pair is stabilized by:

- (A). Three hydrogen bonds
- (B). Two hydrogen bonds



-
- (C). Covalent disulfide linkages
-
- (D). None

Adenine pairs with thymine using two hydrogen bonds, whereas guanine pairs with cytosine via three hydrogen bonds.

#22. Q22. Chargaff's rule for double-stranded DNA states that:

-
- (A). $A + G = T + C$
-
- (B). $A + T = G + C$
-
- (C). $\%A = \%T$ and $\%G = \%C$
-
- (D). None

In double-stranded DNA, the percentage of adenine equals that of thymine and guanine equals cytosine.

#23. Q23. The form of DNA most common in cells under physiological conditions is:

-
- (A). A-DNA
-
- (B). B-DNA (Watson-Crick)
-
- (C). Z-DNA (left-handed)
-
- (D). None

B-DNA is the classic right-handed helical form found in vivo.

#24. Q24. In carbohydrate metabolism, "gluconeogenesis" is:

-
- (A). The breakdown of glycogen into glucose
-
- (B). The synthesis of glucose from non-carbohydrate precursors
-
- (C). None
-
- (D). RBC doping

Gluconeogenesis is the process by which the liver produces glucose from non-carbohydrate precursors.

#25. Q25. The pentose phosphate pathway's main functions are to

-
- (A). Generate lactate and store fat
-
- (B). Produce NADPH and ribose-5-phosphate for biosynthesis
-
- (C). None
-
- (D). RBC doping

The pentose phosphate pathway generates NADPH for reductive biosynthesis and ribose-5-phosphate for nucleotide synthesis.



#26. Q26. A major regulatory enzyme for cholesterol biosynthesis is:

- (A). HMG-CoA reductase
- (B). G6PD
- (C). None
- (D). RBC doping

HMG-CoA reductase is a key enzyme in the cholesterol biosynthetic pathway and the target of statin drugs.

#27. Q27. Lipid transport from the intestines to tissues initially occurs via:

- (A). VLDL
- (B). LDL
- (C). Chylomicrons
- (D). None

Chylomicrons transport dietary lipids from the intestines through the lymphatic system to the bloodstream.

#28. Q28. The amino acids leucine, isoleucine, and valine are known as branched-chain amino acids, and a defect in their metabolism can cause:

- (A). Maple syrup urine disease
- (B). Phenylketonuria (PKU)
- (C). Alkaptonuria
- (D). None

A deficiency in branched-chain α -keto acid dehydrogenase leads to Maple Syrup Urine Disease.

#29. Q29. In protein structure, an α -helix or β -sheet is an example of which level of structure?

- (A). Primary structure
- (B). Secondary structure
- (C). Tertiary structure
- (D). None

Secondary structure refers to local folding patterns such as α -helices and β -sheets stabilized by hydrogen bonds.

#30. Q30. Enzyme specificity is largely due to

- (A). None
- (B). The precise arrangement of active site residues that interact with the substrate
-



- (C). RBC doping
-
- (D). Infectious illusions

The active site of an enzyme is tailored to bind its substrate specifically through shape complementarity and chemical interactions.

#31. Q31. Coenzyme NAD⁺ is derived from which vitamin?

-
- (A). Riboflavin (B2)
-
- (B). Niacin (B3)
-
- (C). Pantothenic acid (B5)
-
- (D). None

NAD⁺ is derived from niacin (vitamin B3); its deficiency can lead to pellagra.

#32. Q32. In red blood cell metabolism, 2,3-BPG is important because it

-
- (A). None
-
- (B). Decreases hemoglobin's oxygen affinity, facilitating oxygen release to tissues
-
- (C). RBC doping
-
- (D). Infectious illusions

2,3-BPG binds deoxyhemoglobin, reducing its oxygen affinity and promoting oxygen release to tissues.

#33. Q33. Porphyrins are disorders of

-
- (A). None
-
- (B). The heme synthesis pathway
-
- (C). RBC doping
-
- (D). Infectious illusions

Porphyrias are caused by defects in enzymes of the heme synthesis pathway, leading to porphyrin accumulation.

#34. Q34. The urea cycle removes

-
- (A). None
-
- (B). Nitrogenous waste by converting ammonia into urea
-
- (C). RBC doping
-
- (D). Infectious illusions

The urea cycle in the liver converts toxic ammonia to urea, which is excreted by the kidneys.



#35. Q35. DNA is the genetic material, as proven by experiments such as

- (A). None
- (B). Griffith's transformation, Avery-MacLeod-McCarty, and Hershey-Chase experiments
- (C). RBC doping
- (D). Infectious illusions

These landmark experiments established DNA, rather than protein, as the molecule of heredity.

#36. Q36. tRNA's primary function is to

- (A). None
- (B). Deliver specific amino acids to the ribosome by matching its anticodon with the mRNA codon
- (C). RBC doping
- (D). Infectious illusions

tRNA molecules are responsible for bringing the correct amino acids during protein synthesis.

#37. Q37. Amino acids at physiological pH typically exist as

- (A). None
- (B). Zwitterions, with both a positively charged amino group and a negatively charged carboxyl group
- (C). RBC doping
- (D). Infectious illusions

At physiological pH, the amino group is protonated and the carboxyl group is deprotonated, forming a zwitterion.

#38. Q38. G6PD deficiency leads to

- (A). None
- (B). Hemolytic anemia under oxidative stress due to insufficient NADPH production
- (C). RBC doping
- (D). Infectious illusions

G6PD is crucial for generating NADPH via the pentose phosphate pathway; deficiency impairs cellular protection against oxidative damage.

#39. Q39. Transamination reactions require a coenzyme derived from vitamin B6, known as

- (A). None
- (B). Pyridoxal phosphate (PLP)
- (C). RBC doping
-



(D). Infectious illusions

Pyridoxal phosphate (PLP) is the active form of vitamin B6 required for amino group transfer in transamination reactions.

#40. Q40. "Essential amino acids" are

- (A). None
- (B). Amino acids that must be obtained through the diet because the body cannot synthesize them
- (C). RBC doping
- (D). Infectious illusions

Essential amino acids cannot be synthesized endogenously and must come from dietary sources.

#41. Q41. β -oxidation of fatty acids occurs primarily in

- (A). None
- (B). The mitochondrial matrix
- (C). RBC doping
- (D). Infectious illusions

Long-chain fatty acids are broken down in the mitochondrial matrix via β -oxidation to generate acetyl-CoA.

#42. Q42. Cholesterol can be converted into all EXCEPT

- (A). None
- (B). Bile acids
- (C). Steroid hormones
- (D). Essential amino acids

Cholesterol is a precursor for bile acids and steroid hormones but not for amino acids.

#43. Q43. Glucose can be converted into glycogen via which process?

- (A). None
- (B). Glycogenesis
- (C). Glycolysis
- (D). Lipolysis

Glycogenesis is the process by which glucose molecules are linked together to form glycogen, a storage form of glucose.

#44. Q44. The "Malate-Aspartate shuttle" helps transport

- (A). None



- (B). NADH equivalents from the cytosol into the mitochondria
- (C). RBC doping
- (D). Infectious illusions

The Malate-Aspartate shuttle carries reducing equivalents (NADH) from the cytosol into mitochondria, where they drive ATP production.

#45. Q45. A point mutation causing a single amino acid substitution is called

- (A). None
- (B). A missense mutation
- (C). A nonsense mutation
- (D). A frameshift mutation

A missense mutation results in the replacement of one amino acid with another in a protein sequence.

#46. Q46. A frameshift mutation arises from

- (A). None
- (B). Insertion or deletion of nucleotides not in multiples of three, shifting the reading frame
- (C). RBC doping
- (D). Infectious illusions

Frameshift mutations change the reading frame, leading to a completely altered protein sequence downstream of the mutation.

#47. Q47. The key regulatory enzyme in glycolysis is

- (A). None
- (B). Phosphofructokinase-1 (PFK-1)
- (C). Lactate dehydrogenase
- (D). Hexokinase

Phosphofructokinase-1 (PFK-1) is a major control point in glycolysis, regulating the conversion of fructose-6-phosphate to fructose-1,6-bisphosphate.

#48. Q48. The “glyoxylate cycle” in plants and some microbes allows

- (A). None
- (B). Conversion of acetyl-CoA to succinate for carbohydrate synthesis
- (C). RBC doping
- (D). Infectious illusions



The glyoxylate cycle bypasses the decarboxylation steps of the TCA cycle, allowing organisms to convert fat into carbohydrates.

#49. Q49. The main route of ammonia detoxification in vertebrates is the

- (A). None
- (B). Urea cycle
- (C). RBC doping
- (D). Infectious illusions

The urea cycle converts toxic ammonia into urea, which is then excreted by the kidneys.

#50. Q50. DNA is stabilized by

- (A). None
- (B). Hydrogen bonds between base pairs and hydrophobic base stacking interactions
- (C). RBC doping
- (D). Infectious illusions

The double helix structure of DNA is maintained by hydrogen bonding between complementary bases and hydrophobic interactions among the stacked bases.

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