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BIOCHEMISTRY | CHEMISTRY OF LIFE

Biology on Chemistry

From Atoms to Enzymes & DNA

70 MCQs

- Answers ticked & highlighted
- Explanation under every MCQ
- 8 topics + quick answer key

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How to read this PDF

✓ **Green row with a tick** shows the correct answer.

Amber box under each MCQ gives the explanation.

Answer key page at the end links back to every MCQ.

1 Section 1: Atoms, Elements & Bonds

10 MCQs | Q1 to Q10

Q1. Which four elements make up about 96% of the mass of living organisms?

A	Calcium, sodium, iron and iodine
B	Sulfur, zinc, copper and chlorine
C	Potassium, magnesium, phosphorus and fluorine
D	**Carbon, hydrogen, oxygen and nitrogen** ✓

Answer: D. Explanation: C, H, O and N (CHON) form nearly 96% of living matter. They build water and all the major biomolecules.

Q2. Which is the most abundant element in the human body by mass?

A	**Oxygen** ✓
B	Carbon
C	Hydrogen
D	Nitrogen

Answer: A. Explanation: Oxygen makes up about 65% of body mass because the body is largely water (H_2O).

Q3. The atomic number of an element is equal to the number of:

A	Neutrons in the nucleus
B	Protons plus neutrons
C	Electron shells
D	**Protons in the nucleus** ✓

Answer: D. Explanation: Atomic number = number of protons. Mass number = protons + neutrons.

Q4. A bond formed by the sharing of electron pairs between atoms is called a:

A	Ionic bond
B	Hydrogen bond
C	Van der Waals force
D	**Covalent bond** ✓

Answer: D. Explanation: Covalent bonds arise from shared electron pairs and hold the atoms of biomolecules together strongly.

Q5. The bond between sodium and chlorine in common salt is a(n):

A	Covalent bond
B	Peptide bond
C	**Ionic bond** ✓
D	Glycosidic bond

Answer: C. Explanation: Sodium gives one electron to chlorine, forming Na^+ and Cl^- ions that attract each other.

Q6. Isotopes of an element differ from each other in their number of:

A	Protons
B	Electrons
C	**Neutrons** ✓
D	Atomic number

Answer: C. Explanation: Isotopes have the same protons but different neutrons, e.g. carbon-12 and carbon-14.

Q7. Which weak bonds stabilise the two strands of the DNA double helix?

A	Peptide bonds
B	Glycosidic bonds
C	Disulfide bonds
D	**Hydrogen bonds** ✓

Answer: D. Explanation: Hydrogen bonds join complementary bases: two between A and T, three between G and C.

Q8. Which radioactive isotope is commonly used to treat thyroid disease?

A	Carbon-14
B	Cobalt-60
C	**Iodine-131** ✓
D	Uranium-238

Answer: C. Explanation: The thyroid gland absorbs iodine, so I-131 can destroy overactive or cancerous thyroid tissue.

Q9. Elements needed only in tiny amounts, such as iron and zinc, are called:

A	Macro elements
B	Noble gases
C	**Trace elements** ✓
D	Isotopes

Answer: C. Explanation: Trace (micro) elements are required in minute quantities but are vital, e.g. iron for haemoglobin.

Q10. How many valence electrons does a carbon atom have?

A	**Four** ✓
B	Two
C	Six
D	Eight

Answer: A. Explanation: With four valence electrons, carbon forms four covalent bonds. This is the basis of organic chemistry.

2 Section 2: Water, Acids & pH

8 MCQs | Q11 to Q18

Q11. Why is a water molecule polar?

A	It contains two oxygen atoms
B	It is an ionic compound
C	**Oxygen attracts the shared electrons more strongly than hydrogen does** ✓
D	Its atoms share electrons equally

Answer: C. Explanation: Oxygen is more electronegative, so it carries a partial negative charge and hydrogen a partial positive charge.

Q12. Which property of water allows some insects to walk on its surface?

A	**Surface tension** ✓
B	Low specific heat
C	Acidity
D	Low boiling point

Answer: A. Explanation: Cohesion between water molecules (hydrogen bonding) gives water a high surface tension.

Q13. Water is called the universal solvent because it:

A	Is a non-polar liquid
B	Never forms hydrogen bonds
C	Has a very low specific heat
D	**Dissolves many ionic and polar substances** ✓

Answer: D. Explanation: Its polarity lets water surround and dissolve ions and polar molecules.

Q14. What is the pH of a neutral solution at 25 °C?

A	**7** ✓
B	0
C	10
D	14

Answer: A. Explanation: At pH 7, H^+ and OH^- are equal. Below 7 is acidic and above 7 is basic.

Q15. The pH of normal human blood is approximately:

A	1.5 to 2.0
B	**7.35 to 7.45** ✓
C	5.5 to 6.0
D	8.5 to 9.5

Answer: B. Explanation: Blood is slightly alkaline and held in a narrow range by buffers such as the bicarbonate system.

Q16. A solution that resists changes in pH is called a:

A	Catalyst
B	Isotope
C	**Buffer** ✓
D	Solvent

Answer: C. Explanation: Buffers absorb extra H^+ or OH^- ions and keep the pH stable.

Q17. High specific heat of water helps organisms to:

A	Digest lipids faster
B	Synthesise DNA
C	**Maintain a stable body temperature** ✓
D	Float in air

Answer: C. Explanation: Water absorbs a lot of heat before its temperature rises, protecting cells from sudden temperature changes.

Q18. Ice floats on liquid water because ice is:

A	More dense than liquid water
B	**Less dense than liquid water** ✓
C	Made only of air
D	Free of hydrogen bonds

Answer: B. Explanation: In ice, hydrogen bonds hold molecules in an open lattice. Floating ice insulates the life below it.

3 Section 3: Carbohydrates

10 MCQs | Q19 to Q28

Q19. Which general formula represents carbohydrates?

A	C_nH_{2n+2}
B	$NH_2CHRCOOH$
C	H_3PO_4
D	**$C_n(H_2O)_n$** ✓

Answer: D. Explanation: Carbohydrates contain carbon, hydrogen and oxygen, with hydrogen and oxygen in a 2:1 ratio as in water.

Q20. Which of the following is a monosaccharide?

A	Sucrose
B	Lactose
C	**Glucose** ✓
D	Starch

Answer: C. Explanation: Glucose is a single sugar unit. Sucrose and lactose are disaccharides and starch is a polysaccharide.

Q21. Table sugar (sucrose) is formed when glucose joins with:

A	Galactose
B	Another glucose
C	**Fructose** ✓
D	Ribose

Answer: C. Explanation: Sucrose = glucose + fructose, joined by a glycosidic bond.

Q22. Milk sugar (lactose) is made of:

A	Glucose and fructose
B	**Glucose and galactose** ✓
C	Two glucose units
D	Fructose and galactose

Answer: B. Explanation: Lactose is a disaccharide of glucose and galactose, digested by the enzyme lactase.

Q23. The main storage polysaccharide of plants is:

A	**Starch** ✓
B	Glycogen
C	Cellulose
D	Chitin

Answer: A. Explanation: Plants store glucose as starch in seeds, roots and tubers such as potato.

Q24. Animals store excess glucose mainly as:

A	**Glycogen** ✓
B	Starch
C	Cellulose
D	Inulin

Answer: A. Explanation: Glycogen is a highly branched polysaccharide stored in the liver and muscles.

Q25. The structural polysaccharide of the plant cell wall is:

A	Glycogen
B	**Cellulose** ✓
C	Starch
D	Chitin

Answer: B. Explanation: Cellulose is made of long beta-1,4 linked glucose chains that give plant cell walls strength.

Q26. Chitin is found in the:

A	Cell walls of plants
B	Bacterial cell membranes
C	**Exoskeleton of arthropods and fungal cell walls** ✓
D	Human skin

Answer: C. Explanation: Chitin is a tough nitrogen-containing polysaccharide in insect exoskeletons and fungal walls.

Q27. Benedict's test is used to detect:

A	Proteins
B	Starch
C	Lipids
D	**Reducing sugars** ✓

Answer: D. Explanation: On heating, blue Benedict's solution turns green, yellow, orange or brick-red depending on sugar amount.

Q28. Iodine solution turns blue-black in the presence of:

A	Glucose
B	**Starch** ✓
C	Protein
D	Fat

Answer: B. Explanation: Iodine fits inside the coiled starch molecule, producing a blue-black colour.

4 Section 4: Lipids

8 MCQs | Q29 to Q36

Q29. Lipids are insoluble in water because they are mostly:

A	Strongly ionic
B	**Non-polar (hydrophobic)** ✓
C	Made of sugars
D	Rich in nitrogen

Answer: B. Explanation: Long hydrocarbon chains are non-polar, so lipids do not mix with polar water.

Q30. A triglyceride (fat) is formed from glycerol and:

A	Three amino acids
B	**Three fatty acids** ✓
C	Three nucleotides
D	Three monosaccharides

Answer: B. Explanation: One glycerol joins three fatty acid molecules, releasing three molecules of water.

Q31. Which bond joins glycerol to a fatty acid?

A	Peptide bond
B	Glycosidic bond
C	**Ester bond** ✓
D	Disulfide bond

Answer: C. Explanation: An ester bond forms between the hydroxyl group of glycerol and the carboxyl group of the fatty acid.

Q32. Saturated fatty acids contain:

A	One or more double bonds
B	**No double bonds between carbon atoms** ✓
C	Only triple bonds
D	Amino groups

Answer: B. Explanation: Saturated chains are straight and pack tightly, so such fats are usually solid at room temperature.

Q33. Phospholipids are the main structural component of:

A	**Cell membranes**	✓
B	Plant cell walls	
C	Ribosomes	
D	Starch granules	

Answer: A. Explanation: They form a bilayer with hydrophilic heads facing water and hydrophobic tails inside.

Q34. Which of the following is a steroid lipid?

A	**Cholesterol**	✓
B	Keratin	
C	Maltose	
D	Glycogen	

Answer: A. Explanation: Cholesterol is a steroid. It is a membrane component and a precursor of sex hormones and vitamin D.

Q35. One gram of fat releases about how many kilocalories of energy?

A	**9 kcal**	✓
B	4 kcal	
C	2 kcal	
D	14 kcal	

Answer: A. Explanation: Fat gives about 9 kcal per gram, more than double the 4 kcal from carbohydrates or proteins.

Q36. Waxy cuticle on plant leaves helps to:

A	Increase transpiration	
B	**Reduce water loss**	✓
C	Absorb water	
D	Store starch	

Answer: B. Explanation: Waxes are very hydrophobic and form a waterproof layer on leaves and stems.

5 Section 5: Proteins & Amino Acids

10 MCQs | Q37 to Q46

Q37. Which are the monomers (building blocks) of proteins?

A	Nucleotides
B	Fatty acids
C	**Amino acids** ✓
D	Monosaccharides

Answer: C. Explanation: Proteins are polymers of amino acids joined in long chains called polypeptides.

Q38. How many standard amino acids are commonly found in proteins?

A	**20** ✓
B	10
C	4
D	64

Answer: A. Explanation: Twenty different amino acids combine in endless sequences to form proteins.

Q39. Which bond joins two amino acids together?

A	Ester bond
B	**Peptide bond** ✓
C	Glycosidic bond
D	Phosphodiester bond

Answer: B. Explanation: A peptide bond forms by dehydration synthesis between the carboxyl group of one amino acid and the amino group of the next.

Q40. Amino acids that the body cannot make and must get from food are:

A	Non-essential amino acids
B	Nucleic acids
C	**Essential amino acids** ✓
D	Fatty acids

Answer: C. Explanation: Examples of essential amino acids are lysine, leucine and tryptophan.

Q41. The primary structure of a protein is its:

A	**Sequence of amino acids**	✓
B	Alpha-helix coiling	
C	Final 3D folding	
D	Association of several polypeptides	

Answer: A. Explanation: Primary structure is the linear order of amino acids, determined by the gene.

Q42. Alpha-helix and beta-pleated sheet are examples of:

A	Primary structure	
B	Tertiary structure	
C	Quaternary structure	
D	**Secondary structure**	✓

Answer: D. Explanation: Secondary structures are held in shape by hydrogen bonds along the polypeptide backbone.

Q43. How many polypeptide chains does a haemoglobin molecule have?

A	One
B	Two
C	Six
D	**Four** ✓

Answer: D. Explanation: Haemoglobin has quaternary structure: two alpha and two beta chains, each carrying one haem group.

Q44. Loss of the 3D shape of a protein due to heat or extreme pH is called:

A	Translation
B	Replication
C	Fermentation
D	**Denaturation** ✓

Answer: D. Explanation: Denaturation breaks weak bonds and destroys function, as when egg white turns solid on boiling.

Q45. In the Biuret test, a positive result for proteins gives which colour?

A	Brick red
B	Blue-black
C	**Violet (purple)** ✓
D	Bright yellow

Answer: C. Explanation: Peptide bonds react with copper ions in alkaline solution and produce a violet colour.

Q46. Which structural protein is the main component of hair and nails?

A	Insulin
B	Haemoglobin
C	**Keratin** ✓
D	Amylase

Answer: C. Explanation: Keratin is a tough fibrous protein found in hair, nails, horns and the outer skin layer.

6 Section 6: Enzymes

8 MCQs | Q47 to Q54

Q47. Most enzymes are chemically:

A	Lipids
B	Carbohydrates
C	Steroids
D	**Proteins** ✓

Answer: D. Explanation: Enzymes are biological catalysts, almost all proteins. A few RNA enzymes are called ribozymes.

Q48. Enzymes speed up a chemical reaction by:

A	Raising the activation energy
B	**Lowering the activation energy** ✓
C	Being used up in the reaction
D	Changing the final products

Answer: B. Explanation: Enzymes provide an easier pathway for the reaction and remain unchanged at the end.

Q49. The region of an enzyme where the substrate binds is the:

A	Peptide bond
B	Cofactor
C	Product site
D	**Active site** ✓

Answer: D. Explanation: The active site has a shape and charge complementary to its specific substrate.

Q50. The 'lock and key' model of enzyme action was proposed by:

A	**Emil Fischer** ✓
B	Daniel Koshland
C	Louis Pasteur
D	Gregor Mendel

Answer: A. Explanation: Fischer proposed the lock and key model. Koshland later suggested the induced fit model.

Q51. The optimum temperature for most human enzymes is about:

A	0 °C
B	**37 °C** ✓
C	60 °C
D	100 °C

Answer: B. Explanation: Human enzymes work best near body temperature. At high temperature they denature.

Q52. The optimum pH of the stomach enzyme pepsin is about:

A	7 (neutral)
B	8.5 (alkaline)
C	12 (strongly alkaline)
D	**2 (acidic)** ✓

Answer: D. Explanation: Pepsin works in the acidic stomach, while trypsin works in the alkaline small intestine.

Q53. A non-protein organic helper molecule of an enzyme is called a:

A	Substrate
B	**Coenzyme** ✓
C	Isomer
D	Product

Answer: B. Explanation: Coenzymes such as NAD^+ and FAD are often derived from vitamins.

Q54. An inhibitor that resembles the substrate and competes for the active site is a:

A	**Competitive inhibitor** ✓
B	Non-competitive inhibitor
C	Cofactor
D	Activator

Answer: A. Explanation: Competitive inhibition can be reduced by adding more substrate.

7 Section 7: Nucleic Acids & ATP

8 MCQs | Q55 to Q62

Q55. The monomer of nucleic acids (DNA and RNA) is a:

A	**Nucleotide**	✓
B	Amino acid	
C	Fatty acid	
D	Monosaccharide	

Answer: A. Explanation: A nucleotide = pentose sugar + phosphate group + nitrogenous base.

Q56. Which sugar is present in DNA?

A	Ribose	
B	Glucose	
C	Fructose	
D	**Deoxyribose**	✓

Answer: D. Explanation: Deoxyribose lacks one oxygen atom at the 2' carbon. RNA contains ribose.

Q57. Which nitrogenous base is found in RNA but not in DNA?

A	Thymine
B	**Uracil** ✓
C	Adenine
D	Cytosine

Answer: B. Explanation: Uracil replaces thymine in RNA and pairs with adenine.

Q58. Which two bases are purines?

A	Cytosine and thymine
B	**Adenine and guanine** ✓
C	Thymine and uracil
D	Cytosine and uracil

Answer: B. Explanation: Purines have a double-ring structure. Pyrimidines (C, T, U) have a single ring.

Q59. How many hydrogen bonds join guanine and cytosine?

A	One
B	Two
C	**Three** ✓
D	Four

Answer: C. Explanation: G pairs with C by three hydrogen bonds. A pairs with T by two.

Q60. Nucleotides in a single DNA strand are joined by:

A	Peptide bonds
B	Hydrogen bonds
C	Disulfide bonds
D	**Phosphodiester bonds** ✓

Answer: D. Explanation: A phosphodiester bond links the sugar of one nucleotide to the phosphate of the next, forming the backbone.

Q61. The double helix model of DNA was proposed by:

A	Hershey and Chase
B	Meselson and Stahl
C	Mendel and Morgan
D	**Watson and Crick** ✓

Answer: D. Explanation: Watson and Crick proposed it in 1953, using X-ray data from Rosalind Franklin and Maurice Wilkins.

Q62. ATP is known as the 'energy currency' of the cell. What does ATP stand for?

A	**Adenosine triphosphate** ✓
B	Amino triphosphate
C	Adenine thymine phosphate
D	Adenosine tri-pyruvate

Answer: A. Explanation: Energy is released when the terminal phosphate bond of ATP is broken, giving ADP and inorganic phosphate.

8 Section 8: Vitamins, Minerals & Tests

8 MCQs | Q63 to Q70

Q63. Deficiency of vitamin C causes:

A	Rickets
B	Night blindness
C	**Scurvy** ✓
D	Beriberi

Answer: C. Explanation: Vitamin C is needed to make collagen. Lack of it causes bleeding gums and slow wound healing.

Q64. Deficiency of vitamin D in children causes:

A	Scurvy
B	**Rickets** ✓
C	Pellagra
D	Pernicious anaemia

Answer: B. Explanation: Vitamin D helps absorb calcium. Without it, bones become soft and bend.

Q65. Night blindness is caused by a deficiency of:

A	**Vitamin A**	✓
B	Vitamin B12	
C	Vitamin K	
D	Vitamin E	

Answer: A. Explanation: Vitamin A is needed to make rhodopsin, the light-sensitive pigment of the retina.

Q66. Which vitamin is essential for normal blood clotting?

A	Vitamin A	
B	**Vitamin K**	✓
C	Vitamin C	
D	Vitamin D	

Answer: B. Explanation: Vitamin K helps the liver make clotting factors such as prothrombin.

Q67. Which mineral is a key part of haemoglobin?

A	Calcium
B	**Iron** ✓
C	Iodine
D	Magnesium

Answer: B. Explanation: Iron in the haem group binds oxygen. Lack of iron leads to anaemia.

Q68. Which metal is present at the centre of the chlorophyll molecule?

A	**Magnesium** ✓
B	Iron
C	Zinc
D	Copper

Answer: A. Explanation: Magnesium sits in the centre of the porphyrin ring of chlorophyll.

Q69. The Sudan III test is used to detect:

A	**Lipids (fats)**	✓
B	Reducing sugars	
C	Proteins	
D	Starch	

Answer: A. Explanation: Sudan III stains fat droplets orange-red because it dissolves in lipids.

Q70. Which of the following vitamins is water-soluble?

A	Vitamin A	
B	Vitamin D	
C	Vitamin K	
D	**Vitamin C**	✓

Answer: D. Explanation: Vitamins A, D, E and K are fat-soluble. Vitamin C and the B-complex are water-soluble.

Quick Answer Key

Tap a question number to jump back to it

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6 : C	7 : D	8 : C	9 : C	10 : A
11 : C	12 : A	13 : D	14 : A	15 : B
16 : C	17 : C	18 : B	19 : D	20 : C
21 : C	22 : B	23 : A	24 : A	25 : B
26 : C	27 : D	28 : B	29 : B	30 : B
31 : C	32 : B	33 : A	34 : A	35 : A
36 : B	37 : C	38 : A	39 : B	40 : C
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46 : C	47 : D	48 : B	49 : D	50 : A
51 : B	52 : D	53 : B	54 : A	55 : A
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