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Biomolecules — CBSE Class 12 Chemistry Chapter Test

FREE CHAPTER TEST · CLASS XII · CHEMISTRY (043) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	37	17 (A 8 · B 3 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 17 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. Section A (Q1–8) contains 6 multiple choice questions and 2 assertion-reason based questions of 1 mark each.
4. Section B (Q9–11) contains short answer questions of 2 marks each.
5. Section C (Q12–14) contains short answer questions of 3 marks each.
6. Section D (Q15) contains case-based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.
7. Section E (Q16–17) contains long answer questions of 5 marks each.
8. There is no overall choice. However, an internal choice has been provided in 1 question in Section B, 1 question in Section C, 1 question in Section D, 2 questions in Section E. Attempt only one of the alternatives in such questions.
9. Use of log tables and calculators is not allowed.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class XII Chemistry (043) Sample Question Paper 2026-27, at about half the length of the 70-mark board paper: 37 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Biomolecules · **Topics:** Carbohydrates: classification · Structure of glucose and fructose · Disaccharides and polysaccharides · Amino acids and proteins · Vitamins · Nucleic acids

SECTION A

This section comprises 8 questions of 1 mark each: 6 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. Which of the following is a ketohexose? 1

(A) Glucose (B) Galactose

(C) Fructose (D) Ribose

2. On complete hydrolysis, proteins give 1

(A) glucose (B) α-amino acids

(C) nucleotides (D) fatty acids and glycerol

3. A deficiency of vitamin D causes 1

(A) scurvy (B) beri-beri

(C) night blindness (D) rickets

4. The base present in RNA but not in DNA is 1

(A) uracil (B) thymine

(C) adenine (D) guanine

5. The number of chiral carbon atoms in the open-chain structure of glucose is 1

(A) 3 (B) 4

(C) 5 (D) 6

6. A deficiency of which vitamin causes pernicious anaemia? 1

(A) Vitamin C (B) Vitamin B_1

(C) Vitamin B_6 (D) Vitamin B_{12}

7. **Assertion (A) :** Glucose does not give Schiff's test or form a hydrogensulphite addition product, although it contains an aldehyde group. 1

Reason (R) : Glucose exists mainly in a cyclic hemiacetal form, in which the –CHO group is not free.

(A) Both A and R are true, and R is the correct explanation of A.

(B) Both A and R are true, and R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

8. **Assertion (A) :** Amino acids are crystalline solids with high melting points and behave like salts. 1

Reason (R) : In aqueous solution, amino acids exist as uncharged molecules $H_2N–CHR–COOH$.

(A) Both A and R are true, and R is the correct explanation of A.

(B) Both A and R are true, and R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

SECTION B

This section comprises 3 short answer questions of 2 marks each.

9. Write the equation for the hydrolysis of sucrose. Why is the product called invert sugar? 2

10. (a) What are essential and non-essential amino acids? Give one example of each. 2

OR

(b) Name the purine and the pyrimidine bases present in DNA.

11. How many different tripeptides can be formed from glycine, alanine and valine if each amino acid is used once in every tripeptide? Write the structure of the peptide bond. 2

SECTION C

This section comprises 3 short answer questions of 3 marks each.

12. (a) What do the following reactions of glucose show about its structure? 3
(i) On prolonged heating with HI it gives n-hexane.
(ii) With ethanoic anhydride it gives a pentaacetate.
(iii) With bromine water it gives gluconic acid.

OR

(b) What do the following reactions of glucose show about its structure?
(i) Oxidation with nitric acid gives saccharic acid.
(ii) It forms an oxime with hydroxylamine.
(iii) It forms a cyanohydrin with HCN.

13. Name the monosaccharide units, and the type of glycosidic linkage, in (i) maltose and (ii) lactose. Are they reducing sugars? (iii) Why is sucrose a non-reducing sugar? 3

14. Compare starch, cellulose and glycogen with respect to their monosaccharide units, the type of linkage and their occurrence or use. 3

SECTION D

This section comprises 1 case-based question of 4 marks, with sub-parts of 1, 1 and 2 marks.

15. A doctor examines a child who has bleeding and swollen gums and whose small wounds heal slowly. The child's diet has very little fresh fruit or green vegetables. The doctor explains that some vitamins must be eaten regularly because the body cannot store them, while others can be stored for long periods.

(I) Which vitamin is lacking in the child's diet, and what is the deficiency disease called? [1]

(II) Why must this vitamin be supplied in the diet regularly? [1]

(III) Name the deficiency diseases caused by a lack of vitamin A and of vitamin B_1, and give one source of each vitamin. [2]

OR

(III) Classify vitamins A, B_{12}, C, D, E and K as fat-soluble or water-soluble. Which group can be stored in the body, and where? [2]

SECTION E

This section comprises 2 long answer questions of 5 marks each.

16. (a) (i) Classify carbohydrates into monosaccharides, oligosaccharides and polysaccharides, and into reducing and non-reducing sugars, with one example of each. 5

(ii) Describe the cyclic structure of D-glucose. What are anomers?

(iii) Why does glucose pentaacetate not react with hydroxylamine?

OR

(b) (i) What is a zwitterion? Explain why amino acids are amphoteric.

(ii) Write the equation for the formation of the dipeptide glycylalanine.

(iii) Distinguish between fibrous and globular proteins, with one example of each.

17. (a) (i) What is the difference between a nucleoside and a nucleotide? Name the three components of a nucleotide. 5

(ii) Describe the double helix structure of DNA. Which bases pair with which?

(iii) State two functions of nucleic acids.

OR

(b) (i) Describe the primary, secondary, tertiary and quaternary structures of proteins.

(ii) What is denaturation of a protein? Give two examples.

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
(C)	(B)	(D)	(A)	(B)	(D)	(A)	(C)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (C). Fructose, $C_6H_{12}O_6$, has its keto group at C-2. Glucose and galactose are aldohexoses, and ribose is an aldopentose.

Q2. Answer (B). Proteins are polymers of α-amino acids joined by peptide (–CO–NH–) bonds; hydrolysis breaks these bonds.

Q3. Answer (D). Vitamin D is needed for the absorption of calcium; its deficiency causes rickets (osteomalacia in adults).

Q4. Answer (A). RNA has U in place of the T of DNA.

Q5. Answer (B). C-2, C-3, C-4 and C-5 each carry four different groups.

Q6. Answer (D). Vitamin B_{12} is needed to form red blood cells; its deficiency causes pernicious anaemia (red blood cells deficient in haemoglobin).

Q7. Answer (A). Only a very small fraction is in the open-chain form; the cyclic form explains these observations. R explains A. Answer A.

Q8. Answer (C). A is true. R is false: in water (and in the solid) amino acids exist as dipolar ions (zwitterions), H_3N^+–CHR–COO^-, which is why they behave like salts. Answer C.

Q9. (2 marks) Answer: glucose + fructose; the rotation changes from + to −.
$C_{12}H_{22}O_{11} + H_2O$ (H^+ or invertase) → $C_6H_{12}O_6$ (glucose) + $C_6H_{12}O_6$ (fructose). [1]
Sucrose is dextrorotatory, but the mixture is laevorotatory, because fructose (−92.4°) rotates more strongly to the left than glucose (+52.5°) does to the right: the sign of rotation is inverted. [1]

Q10. (2 marks) Answer: (a) e.g. valine; glycine; (b) A, G; C, T.
(a) Essential amino acids cannot be made in the body and must be supplied in the diet, e.g. valine, leucine, lysine. [1] Non-essential amino acids can be made in the body, e.g. glycine, alanine. [1]
OR (b) Purines: adenine (A) and guanine (G). [1] Pyrimidines: cytosine (C) and thymine (T). [1]

Q11. (2 marks) Answer: 6; –CO–NH–.
3! = 6 tripeptides (Gly-Ala-Val, Gly-Val-Ala, Ala-Gly-Val, Ala-Val-Gly, Val-Gly-Ala, Val-Ala-Gly). [1]
The peptide (amide) bond: –CO–NH–, formed between the –COOH of one amino acid and the $–NH_2$ of the next, with loss of water. [1]

Q12. (3 marks) Answer: (a) straight chain; five –OH; –CHO; (b) primary alcohol; carbonyl group.
(a) (i) The six carbon atoms are in a straight chain. [1]
(ii) It has five –OH groups (on different carbon atoms, as it is stable). [1]
(iii) The carbonyl group is an aldehyde group (–CHO), oxidised to –COOH by a mild oxidising agent. [1]
OR (b) (i) Nitric acid oxidises both ends to saccharic acid (glucaric acid), $HOOC–(CHOH)_4–COOH$: glucose has a primary alcohol ($–CH_2OH$) group. [1]
(ii) With hydroxylamine it forms an oxime, and (iii) with HCN a cyanohydrin: glucose has a carbonyl group. [2]

Q13. (3 marks) Answer: maltose α-1,4 glucose; lactose galactose + glucose; both reducing.
(i) Maltose: two α-D-glucose units, linked C-1 to C-4 (α-1,4); reducing. [1]
(ii) Lactose: β-D-galactose and β-D-glucose, linked C-1 (galactose) to C-4 (glucose); reducing. [1]
(iii) In sucrose the link is between C-1 of glucose and C-2 of fructose, the reducing groups of both units, so there is no free hemiacetal group. [1]

Q14. (3 marks) Answer: starch α-glucose; cellulose β-glucose; glycogen highly branched α-glucose.
Starch: α-D-glucose; amylose (unbranched, C1–C4 α-links) and amylopectin (branched, C1–C4 and C1–C6 α-links); the main storage carbohydrate of plants. [1]
Cellulose: β-D-glucose, unbranched chains linked C1–C4 (β); the main structural material of plant cell walls; humans cannot digest it. [1]
Glycogen: α-D-glucose, like amylopectin but more highly branched; the storage carbohydrate of animals (liver, muscles). [1]

Q15. (4 marks) Answer: (I) vitamin C, scurvy; (II) water-soluble, not stored; (III) xerophthalmia and beri-beri.
(I) Vitamin C (ascorbic acid); scurvy. [1]
(II) It is water-soluble, so excess is excreted in urine and it is not stored in the body. [1]
(III) Vitamin A: xerophthalmia (night blindness) — sources: fish-liver oil, carrots, milk. [1] Vitamin B_1: beri-beri — sources: yeast, milk, green vegetables, cereals. [1]
OR (III) Fat-soluble: A, D, E, K; water-soluble: B_{12}, C. [1] The fat-soluble vitamins are stored in the liver and adipose (fat-storing) tissue. [1]

Q16. (5 marks) Answer: (a) classification; α and β anomers at C-1; no free –CHO; (b) zwitterion; glycylalanine; fibrous and globular.
(a) (i) Monosaccharides cannot be hydrolysed further (glucose); oligosaccharides give 2–10 monosaccharide units on hydrolysis (sucrose); polysaccharides give a large number (starch). [1] Reducing sugars reduce Tollens' and Fehling's reagents (glucose, maltose); non-reducing sugars do not (sucrose). [1]
(ii) The –OH at C-5 adds to the –CHO group, forming a six-membered ring (pyranose) with five carbons and one oxygen; C-1 becomes a new chiral centre (a hemiacetal). [1] The two forms that differ only in the configuration at C-1 are anomers: α-D-glucose (C-1 –OH on the same side as the ring –O– in the Fischer projection, below the ring in Haworth) and β-D-glucose. [1]
(iii) In the pentaacetate the C-1 –OH is acetylated, so the ring cannot open to give a free –CHO group. [1]
OR (b) (i) In water an amino acid exists as a dipolar ion (zwitterion), $H_3N^+–CHR–COO^-$. [1] It is amphoteric: the $–COO^-$ group accepts a proton (reacts with acids) and the $–NH_3^+$ group donates one (reacts with bases). [1]
(ii) $H_2N–CH_2–COOH + H_2N–CH(CH_3)–COOH \rightarrow H_2N–CH_2–CO–NH–CH(CH_3)–COOH$ (glycylalanine) + H_2O. [1]
(iii) Fibrous proteins have long parallel chains held by hydrogen and disulphide bonds; they are insoluble in water (keratin, myosin). [1] Globular proteins are folded into spherical shapes and are usually soluble in water (insulin, albumins). [1]

Q17. (5 marks) Answer: (a) nucleoside + phosphate = nucleotide; A–T, G–C; (b) four levels of structure; denaturation.
(a) (i) A nucleoside is a base joined to a sugar (at C-1′); a nucleotide is a nucleoside with a phosphate group at C-5′ of the sugar. [1] Components: a nitrogenous base, a pentose sugar (2-deoxyribose in DNA, ribose in RNA) and a phosphate group. [1]
(ii) Two polynucleotide strands are coiled round each other in a right-handed double helix, with the sugar-phosphate backbones outside and the bases inside, held by hydrogen bonds between bases. [1] Adenine pairs with thymine (two hydrogen bonds) and guanine with cytosine (three). [1]
(iii) DNA carries the genetic information and passes it on (heredity); DNA and RNA direct protein synthesis. [1]
OR (b) (i) Primary: the sequence of amino acids in the chain. [½] Secondary: the regular folding of the chain, the α-helix or β-pleated sheet, held by hydrogen bonds between –CO– and –NH– groups. [1] Tertiary: the overall folding of the chain (fibrous or globular), held by hydrogen bonds, disulphide links, van der Waals and electrostatic forces. [1] Quaternary: the arrangement of two or more polypeptide chains (subunits). [½]
(ii) Denaturation is the loss of biological activity when the secondary and tertiary structures are destroyed by heat or a change in pH, the primary structure remaining intact. [1] Examples: coagulation of egg white on boiling; curdling of milk. [1]

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