

[This question paper contains 4 printed pages.]

(7)

Your Roll No. 2024.

Sr. No. of Question Paper : 1541

G

Unique Paper Code : 2492011101

Name of the Paper : Biomolecules (DSC-1)

Name of the Course : **B.Sc. (Hons.) Biochemistry**

Semester : I

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **six** questions.
3. Attempt any **four** questions.
4. **All** questions carry equal marks.
5. Question No. 1 is compulsory.



1. Identify the following statements as true or false and justify your answer :

(a) All Amino acids are optically active.

(b) Histidine acts as biological buffer at physiological pH.

P.T.O.

- (c) Proline gives yellow color with Ninhydrin.
- (d) Trehalose is non reducing disaccharide.
- (e) Fatty acids when put in aqueous solution make micelles.
- (f) DNA does not show increase in absorbance on heating.
- (g) Chitin is an example of storage homopolysaccharides.
- (h) At a pH more than the pI, amino acids exist in negatively charged form.
- (i) Vit K has antioxidant activity.
- (j) Glycosaminoglycans have a slippery consistency.
(1.5×10=15)

2. Differentiate between the following :

- (a) B-DNA and A-DNA
- (b) Essential and Nonessential Amino acids
- (c) Glycerophospholipid and Sphingophospholipid
- (d) Anomers and Epimers
- (e) Water soluble and Fat-soluble vitamins
(3×5=15)

3. (a) Why is tryptophan poorly soluble but arginine is readily soluble in water?
- (b) The pKa value of carboxylic group in amino acids is lower than that in acetic acid. Explain.
- (c) Sucrose is non-reducing sugar, but lactose is reducing sugar. Why?
- (d) Why do animals store glycogen but not glucose for their energy need? Explain in brief.
- (e) Why TAG is better form of storage in comparison to Glycogen? (3×5=15)
4. (a) Discuss the titration curve of glycine, indicating pka, pl and buffering zone
- (b) What are glycosaminoglycans? Explain their role with help of examples.
- (c) Draw the structure of following :
- (i) Sulphur containing amino acid
 - (ii) 7 methyl Guanosine
 - (iii) Phosphatidylethanolamine
 - (iv) Beta D galactosamine
 - (v) Lactose (5,6,4)

5. (a) Salient features of Watson and Crick DNA double helix model.
- (b) Name the vitamin deficiency and write identifying symptoms of the following conditions :
- (i) Scurvy
 - (ii) Pellagra
 - (iii) Rickets
 - (iv) Megaloblastic anaemia
- (c) Distinguish between Glycoproteins and Proteoglycans giving suitable examples. (5,6,4)
6. (a) Discuss the role of Lipids as signalling molecule.
- (b) List out the various roles of nucleotides.
- (c) Give reactions for the following :
- (i) Action of alkali on RNA
 - (ii) Reaction of monosaccharides with cupric ions
 - (iii) Action of phospholipase A on lecithin
 - (iv) Action of enzyme sucrase on sucrose in presence of HCL (3,4,8)

[This question paper contains 4 printed pages.]

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Your Roll No. 2024.

Sr. No. of Question Paper : 1617

G

Unique Paper Code : 2492011103

Name of the Paper : Biochemical Techniques

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : I

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **six** questions.
3. Attempt any **four** questions.
4. **All** questions carry equal marks.
5. Question No. 1 is compulsory.



1. (a) Explain the following :

(i) Proteins are eluted from ion exchange column by increasing salt concentration

P.T.O.

- (ii) During electrophoresis, a tracking dye is loaded along with the sample
- (iii) Globular proteins have higher sedimentation velocity than fibrous proteins
- (iv) Glass cuvettes are not suitable for measuring the absorbance of DNA solutions

(b) Define the following terms :

- (i) Relative Centrifugal Force
- (ii) Quantum yield
- (iii) Exclusion limit (12,3)

2. (a) Explain how SDS-PAGE is used to determine the molecular weight of a protein.
- (b) Diagrammatically explain the working of a spectrophotometer.
- (c) Compare the techniques of TLC and paper chromatography. (6,4,5)
3. (a) Discuss the principle of fluorescence and give any two applications.

- (b) Compare the features of a table top centrifuge and a high-speed centrifuge.
- (c) Explain why large molecules move faster as compared to smaller molecules in gel permeation chromatography. (5,5,5)
4. (a) Explain the role of the following :
- (i) Spacer arm in affinity chromatography
 - (ii) EtBr in agarose gel electrophoresis
- (b) What are the different ways to elute a protein from an ion exchange column?
- (c) A solution of UTP of concentration 87.9 mg/litre has an absorbance of 0.75 at 260nm. If the light path is 1.0cm and the molecular weight of UTP is 586, calculate the molar absorbance coefficient of UTP. (6,5,4)
5. (a) Differentiate between the following :
- (i) Cation and anion exchanger
 - (ii) Extrinsic fluor and intrinsic fluor

(b) Discuss the principle of affinity chromatography. What is the ligand used for purification of the following :

(i) Histidine-tagged protein

(ii) Avidin

(iii) mRNA

(c) Explain the technique of density gradient centrifugation. (6,5,4)

6. Write short notes on the following :

(a) Lambert-Beer Law

(b) Staining methods in electrophoresis

(c) Isoelectric focussing (5,5,5)

[This question paper contains 8 printed pages.]

(9)

Your Roll No. 2024

Sr. No. of Question Paper : 1579

G

Unique Paper Code : 2492011102

Name of the Paper : Proteins (DSC-2)

Name of the Course : B.Sc. (Hons) Biochemistry

Semester : I

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 6 questions.
3. Attempt **any 4** questions.
4. **All** questions carry equal marks.
5. Question no. 1 is compulsory.



1. A. Choose the best choice :

(a) What accounts for peptide bond planarity within a polypeptide?

P.T.O.

- (i) The fully double bonded peptide bond.
 - (ii) Electronegativity differences between nitrogen and carbon.
 - (iii) Hydrogen bonding between amino acid side chains and water.
 - (iv) Partial double bond character of the peptide bond.
 - (v) Rotation around ψ and ϕ bonds.
- (b) Which of the following is most correct :
- (i) Charged amino acids are never buried in the interior of a protein.
 - (ii) Charged amino acids are seldom buried in the interior of a protein.
 - (iii) All hydrophobic amino acids are buried when a protein folds.
 - (iv) Tyrosine is only found in the interior of proteins.

- (v) Glycine is rarely found in proteins because it is too destabilizing.
- (c) Proteins are classified within families or super-families based on similarities in :
- (i) Evolutionary origin.
 - (ii) Physico-chemical properties,
 - (iii) Structure and/or function.
 - (iv) Subcellular location.
 - (v) Subunit structure
- (d) The oxygen bound to hemoglobin or myoglobin is directly attached to the :
- (i) Helix-F in the protein
 - (ii) Proximal Histidine
 - (iii) Fe (II)
 - (iv) Heme N
 - (v) Fe (III)

B. Give reasons for the following :

- (a) Glycine and proline are found in β turns.
- (b) Silk fiber has high tensile strength.
- (c) Hydropathy plots are used to determine membrane protein topology.
- (d) Disulphide bonds make proteins thermostable.

C. Give an example and one function of the following:

- (a) Conjugated protein
- (b) Dipeptide
- (c) Basic protein (4,8,3)

2. (a) Give salient features of α helix and β pleated structure.

(b) Describe the primary, secondary, tertiary and quaternary structure of collagen. Elaborate on the

role of Vitamin C in collagen biosynthesis.

- (c) Ramachandran plot is also referred to as a dihedral plot. Explain. (4,8,3)

3. (a) Describe in detail, the steps involved in Solid phase peptide synthesis. What are the two major advantages of this method?
- (b) An oligopeptide was analyzed. Given the data below, what is its sequence?
- (i) Amino acid analysis revealed the composition Asp, Asn, 2Glu, Gly, Lys, 2Met Phe, 2Pro.
 - (ii) Carboxypeptidase digestion gave the results as Glycine.
 - (iii) N-terminal analysis afforded the DNP derivative of glutamic acid
 - (iv) Treatment of the peptide with cyanogen bromide gave three fragments. Sanger N-terminal analysis of these three fragments

gave the DNP derivatives of Glu, Pro, and Asp.

(v) Cleavage of the oligopeptide with trypsin gave two fragments. Sanger analysis of these two fragments both gave the DNP derivative of Glu.

(vi) Cleavage of the oligopeptide with chymotrypsin gave two fragments. Sanger analysis of these two fragments gave DNP derivatives of Glu and Lys.

(c) Give the role of the following reagents with the associated reaction in Protein chemistry:

(i) Dansyl chloride

(ii) β -Mercaptoethanol (8,4,3)

4. (a) What are Hill plots? Myoglobin has a linear plot,

whereas hemoglobin plots are non-linear with variable slope. Explain.

(b) How do the following affect O_2 binding curves of hemoglobin? What is the biological impact of it.

(i) 2, 3 BPG

(ii) CO_2

(iii) pH

(c) In brief, give the Sequential or Induced Fit Model of Cooperative O_2 Binding to Hemoglobin.

(6,6,3)

5. (a) Give the biochemical basis and manifestation of the following diseases :

(i) Alzheimer's disease

(ii) Sickle cell anemia.

(b) Protein S will fold into its native conformation only when protein Q is also present in the solution. However, protein Q can fold into its native conformation without protein S. Detail out the P.T.O.

folding mechanism of protein Q and protein S.

(8,7)

6. Give short notes on the following :

(a) Protein domain

(b) β barrel proteins

(c) Protein sequence databases

(d) Supersecondary structures

(e) Protein denaturation

(3×5)