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Roll No.

S. No. of Question Paper : **7767**

Unique Paper Code : **2491102** **F-1**

Name of the Paper : **Proteins**

Name of the Course : **B.Sc. (Hons.)/Bio-chemistry (DC-1.2)**

Semester : **I**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question No. **1** is compulsory.

1. (*a*) State true *or* false with justification for each : 7×2=14

    (*i*) Globular proteins are soluble whereas fibrous proteins are insoluble.

    (*ii*) A monomeric protein can have one or two N-terminal amino acids.

    (*iii*) Animal cells are broken using harsh abrasive techniques because of a cell wall.

    (*iv*) Protein databanks enable 3-D viewing of proteins.

    (*v*) Fetal haemoglobin has a higher affinity for oxygen than adult haemoglobin.

    (*vi*) Trans membrane domains of single pass proteins are usually within β-sheets.

    (*vii*) Immunoglobulins can bind diverse epitopes due to the constant domains in their structure.

P.T.O.

(*b*)   Write the scientific contributions of any *five* Nobel Laureates :   5×1=5

   (*i*)   Kendrew

   (*ii*)   Sanger

   (*iii*) Perutz

   (*iv*)   Pauling

   (*v*)   Anfinsen

   (*vi*)   Merrifield

2.   Explain the principles for the following techniques as used in protein chemistry :   5,5,4

   (*i*)   2-D electrophoresis

   (*ii*)   Mass spectrometry

   (*iii*) C-terminal analysis

3.   (*a*)   Haemoglobin and Myoglobin are both oxygen binding proteins, however they serve different

   functions in physiology. Explain.   7

   (*b*)   Derive the Hill equation and indicate how the Hill number is a useful diagnosis of cooperativity

   between the subunits of proteins.   7

4.   What techniques would you use in the following and why ? Also mention the principles involved.

   (*i*)   Extraction of a protein from a bacterial cell.

   (*ii*)   Separation of two proteins which are hydrophobic.

   (*iii*) Separation of histones (basic proteins) and albumins (acidic protein).   4,4,6

5. (*a*) Write the structures and role of the following reagents in protein chemistry :

   (*i*) β-Mercaptoethanol

   (*ii*) Dansyl chloride

   (*iii*) Hydrazine

   (*iv*) Performic acid

   (*v*) 6N HCl

   (*vi*) Cynogen bromide   6×1.5=9

   (*b*) Determine the amino acid sequence of a specific polypeptide based on the information provided below :

   (*i*) Complete hydrolysis by 6N HCl at 110°C followed by amino acid analysis indicated the presence of Gly, Leu, Phe and Tyr in a 2 : 1 : 1 : 1 molar ratio.

   (*ii*) Treatment of the peptide with 1-fluoro-2, 4-dinitro benzene followed by complete hydrolysis and chromatography indicated the presence of 2, 4-dinitrophenyl derivative of tyrosine. No free tyrosine could be found.

   (*iii*) Complete digestion of the peptide with chymotrypsin followed by chromatography yielded free tyrosine and leucine plus a tripeptide containing Phe and Gly in a ratio of 1 : 2.   5

6. Explain the following statements :

   (*i*) The peptide bond is a semi-rigid bond.

   (*ii*) The phi-psi plot for Glycine is scattered about the four quadrants of the Ramachandran map.

(*iii*) Proline and glycine are usually found in a β turn.

(*iv*) D amino acid containing peptides form left handed helices.

(*v*) Disulfide bonds make proteins resistant to denaturation.

(*vi*) Hemoglobin has a lower oxygen affinity in the presence of 2, 3 BPG.

(*vii*) Misfolded proteins can lead to diseases.   7×2=14

7. (*a*) Elaborate how the concerted and sequential models explain the phenomenon of cooperativity proposed for hemoglobin oxgyen binding curve.   8

   (*b*) How do chaperones contribute to protein folding ?   6

8. Write short notes on any *two* of the following :   2×7=14

   (*i*) Edman method of sequencing proteins

   (*ii*) Use of protein databases

   (*iii*) Membrane proteins