[This question paper contains 6 printed pages.]

(7) **Your Roll No.** 2023

Sr. No. of Question Paper : 4537 **E**

Unique Paper Code : 32491201

Name of the Paper : Proteins

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

Semester : II

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

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

1. (a) State whether true or false with justification:

(i) Proline is rarely present in an alpha-helix.

(ii) Fibroin, the silk protein is rich in Ala and Gly residues.

(iii) Persons living at high altitudes have higher levels of BPG in blood.

(iv) Myoglobin is abundant in the muscle of diving mammals such as seals and whales.

(v) French press is used for homogenizing fibrous proteins.

(vi) Dialysis is used for desalting of protein preparations.

(b) Give one example of each of the following proteins/ peptide :

(i) Glycoprotein

(ii) Hormone

(iii) Metallo-protein

(iv) Storage protein

(v) Transport protein

(vi) Antibiotic (12,3)

2. (a) Two peptides are to be separated by ion exchange chromatography. At the pH of the mobile phase to be used on the column, peptide A has a net charge of –3 and peptide B has a net charge of +1. Which peptide would elute first from the cation-exchange resin and anion-exchange resin? Explain why?

(b) Describe Anfinsen's experiment, concerning the denaturation and renaturation in ribonuclease A.

(c) Comment on the following :

(i) Woolen clothes shrink when washed in hot water but silk items do not.

(ii) 2D gel electrophoresis is used for the resolution of complex mixture of proteins.

(iii) Ammonium sulfate is the preferred salt for salt fractionation of proteins.

(iv) Glycine in proteins does not have restricted psi and phi dihedral angles. (3,4,8)

3 (a) Differentiate between the following :

(i) Integral and peripheral membrane proteins

(ii) Salting in and salting out

(iii) Globular and fibrous proteins

(iv) HPLC and FPLC

(v) Concerted and sequential model (15)

4. (a) Describe the solid phase peptide synthesis method given by Merrifield. Also give its advantages.

(b) Explain the principle of affinity chromatography. Discuss its advantages over other column chromatographic methods of protein purification.

(c) Write down the functions of the following reagents in Protein chemistry :

(i) Performic acid

(ii) Phenyl isothiocyanate

(iii) 1-fluoro-2,4-dinitrobenzene

(iv) Urea (6,5,4)

5. (a) Explain how hydropathy plots predict transmembrane domains of proteins.

(b) Explain the molecular basis of the Bohr effect.

(c) Discuss the molecular basis and disease manifestation of the following diseases :

(i) Sickle cell anemia

(ii) Prion disease (3,4,8)

6. (a) Give the various steps involved in the Edman degradation method of determining the sequence of a given protein.

(b) Discuss the various bonds which lead to the stability of a protein.

(c) Carbon monoxide binds to free heme molecules more than 20,000 times better than O_2 but it binds only about 200 times better when the heme is bound in myoglobin. Explain why?

(d) Define the following :

(i) Sedimentation coefficient

(ii) Exclusion limit

(iii) Isopycnic centrifugation (5,4,3,3)

7. (a) What are protein databases? Name any one and explain its uses.

(b) Compare and contrast the O_2 binding curves of Myoglobin and Hemoglobin.

(c) Differentiate between α helix and β pleated structure. (4,6,5)

8. Write short notes on the following :

(a) Ramachandran map

(b) Lyophilization

(c) Fetal hemoglobin

(d) Molecular chaperones

(e) Antibody structure (15)

[This question paper contains 6 printed pages.]

(8) **Your Roll No.** 2023

Sr. No. of Question Paper : 4657 **E**

Unique Paper Code : 32491202

Name of the Paper : Enzymes

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

Semester : II

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **8** questions.
3. Attempt any **5** questions.
4. **All** questions carry equal marks.
5. Question No. **1** is compulsory.

1. (a) Explain the following :

(i) At very high substrate concentrations the enzyme activity becomes constant.

P.T.O.

(ii) A purified enzyme has maximum specific activity.

(iii) Penicillin is an enzyme inhibitor.

(iv) Enzymes can be regulated by irreversible covalent modifications.

(v) Streptokinase is used in enzyme therapy.

(b) Define the following terms :

(i) Turnover Number

(ii) Activation energy

(iii) Initial velocity

(iv) Specific activity

(v) Isozyme (10,5)

2. (a) What are the features of enzymes that make them remarkable biological catalysts?

(b) Pyridoxal phosphate is a versatile coenzyme. Explain with the help of three examples.

(c) Explain why ser-195 in chymotrypsin has a lower pKa than other serine residues. (4,6,5)

3. (a) Explain why ATCase is an important regulatory enzyme. Describe how this enzyme is regulated by allosteric modulation.

(b) Using lineweaver-Burk plots explain the following types of enzyme inhibitions:

(i) Competitive

(ii) Non-competitive

(c) How do you express activity of an enzyme? Explain why enzyme activities are measured under saturating substrate concentration. (6,6,3)

4. (a) Discuss the catalytic mechanism of lysozyme.

(b) How are enzymes classified? Explain giving an example of each class.

(c) What is the ratio of the [S] to K_M when the velocity of an enzyme catalyzed reaction is 80% of its V_{max}? (6,6,3)

P.T.O.

5. (a) Specific activity of an enzyme is an important parameter in following the progress of enzyme purification. Comment.

(b) Name the cofactor and give the structure of the following enzymes :

(i) Transaminase

(ii) Pyruvate carboxylase

(c) Give an example of the following :

(i) A metalloenzyme

(ii) An allosteric enzyme

(iii) An therapeutic enzyme

(iv) An enzyme present in tears (6,5,4)

6. (a) Discuss with the help of examples how enzymes can be regulated by reversible covalent modification.

(b) Differentiate between the following :

(i) Holoenzyme and apoenzyme

(ii) Active site and regulatory site

(c) How will you differentiate between single and double displacement reactions kinetically?

(6,5,4)

7. (a) Explain the importance and the regulaory mechanism of the enzyme aspartate transcarbmoylase.

(b) Derive the Michaelis-Menten equation. Show how it can be transformed to LB plot. Compare the LB plot with Eadie-Hofstee plot.

(c) The drug allopurinol is used in the treatment of gout. Explain.

(6,6,3)

8. Write short notes on the following :

(a) Immobilized enzymes

(b) Protease inhibitors

(c) Zymogens (5,5,5)