

SCHOOL OF CHEMICAL AND LIFE SCIENCE
B.Sc.-M.Sc. INTEGRATED PROGRAMME
SEMESTER II EXAMINATION, AUGUST 2022
PAPER CODE: BTX-CC06 TH
PAPER TITLE: ENZYMES AND PROTEINS

Time: 3 Hours

Maximum Marks: 75

Attempt all questions. All parts of a question must be attempted in continuation. Start the answer to the next question on a new page. Cite examples and draw labeled diagrams wherever necessary.

Q.1 Mention True/False for the following statement.

[15x1=15]

- A. Irreversible inhibitors do not follow Michaelis Menten rate equation.
- B. Catalytic activity of allosteric enzymes can be upregulated by inhibitors while its activity can be downregulated by activators.
- C. Enzyme present in Relaxed (R) state is inactive and has less affinity for substrate.
- D. In humans, creatinine kinase enzyme is associated with myocardial infarction and muscle diseases.
- E. Amino acids in solution at neutral pH exist predominantly as dipolar ions.
- F. Aspartic acid and Glutamic acid contain basic side chains.
- G. The C-N distance in a peptide bond is typically 1.23 Å.
- H. Almost all peptide bonds in proteins are trans.
- I. Without 2,3-BPG, hemoglobin would be an extremely inefficient oxygen transporter.
- J. The angle of rotation about the peptide bond is called phi (Φ).
- K. Tosyl-L-phenylalanine chloromethyl ketone (TPCK) is a substrate analog for chymotrypsin.
- L. The constant k_{cat} is a first-order rate constant. It is also called the turnover number.
- M. The active site is the region of the enzyme that is mostly involved in lowering the activation energy ($\Delta G^\ddagger$) of the reaction.
- N. The Double-Reciprocal plots are more useful in plotting experimental data.
- O. Glucokinase may transfer phosphate from ATP to several different hexose sugars.

Q.2. Answer ANY THREE of the following.

[3x5=15]

- A. Mention different classes of amino acids based on the general chemical characteristics of their R groups.
- B. Why knowing amino acid sequences of a protein is important?
- C. Discuss the salting out mechanism.
- D. Write a short note on affinity chromatography.
- E. Discuss Automated Edman degradation method used for peptide sequencing.

Q.3. Answer ANY THREE of the following.

[3x5=15]

- A. Write a short note on secondary structures found in proteins.
- B. Discuss special types of helices present in the α -keratin and collagen.
- C. Discuss the Anfinsen experiments that helped in understanding the protein folding.
- D. Discuss how the oxygen binding changes the quaternary structure of haemoglobin.
- E. Write a short note on two models that explain the hemoglobin cooperativity.

Q.4. Answer ANY THREE of the following.

[3x5=15]

- A. Mention common features of the active sites of enzymes.
- B. Write a short note on international classification of enzymes. Mention different 'class name' of enzymes.
- C. What is an activation energy? How enzyme lowers the activation energy of a reaction?
- D. Discuss general mechanisms of catalysis followed by enzymes.
- E. Derive the Michaelis-Menten equation. Mention the significance of K_m and V_{max} .

Q5. Answer ANY THREE of the following.

[3x5=15]

- A. Explain the three distinct mechanisms used inside the cell to regulate enzyme activity.
- B. What are the properties of allosteric enzymes? Also discuss mechanisms regulating the activity of these enzymes.
- C. List five commonly assayed enzymes in the clinical analysis.
- D. What are the differences between reversible and irreversible inhibitors? Discuss two examples with the help of diagram.
- E. What is enzyme immobilization? Explain different methods of enzyme immobilization.

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