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Total No. of Questions: [11]

M. Sc. Chemistry (Semester – 2nd)
BIO-ORGANIC CHEMISTRY
Subject Code: MCHMD1-212
Paper ID: 20220211

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It carries 16 marks. It consists of 4 questions of 4 marks each.
2. Section B consist of 4 questions of 8 marks each. The student has to attempt any 3 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(4 marks each)**

Q1. How does denaturation affect protein function, and what can cause it?

Q2. Chymotrypsin cleaves peptide bonds on the carboxyl side of aromatic and large hydrophobic amino acids. Describe how chymotrypsin selectively recognizes and cleaves these peptide bonds.

Q3. Write a short note on ribozyme and iRNA.

Q4. Define "Logical synthon" and "illogical synthon" with suitable examples. Write their corresponding synthetic equivalents.

Section – B **(8 marks each)**

Q5. (a) How do specific amino acid sequences at the N-terminal or C-terminal influence the function of signaling proteins or receptors?

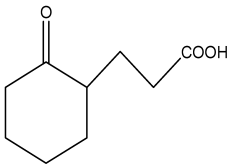
(b) How is the peptide cleaved from the solid support at the end of the synthesis? Discuss the reagents and conditions used for cleavage, and how the cleavage process may differ depending on the resin and protecting groups.

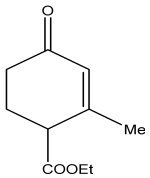
Q6. (a) What are cofactors, and how do they enhance enzyme activity? Describe the difference between prosthetic groups and coenzymes.

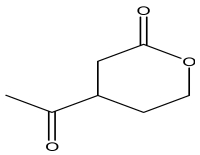
(b) Discuss the role of enzymes in reactions like condensation, group transfer, and carboxylation. Provide examples of enzymes involved in these types of reactions.

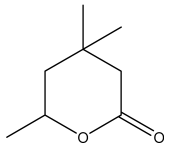
Q7. Describe the principle of the Polymerase Chain Reaction (PCR). What key steps are involved, and how does the process amplify specific DNA Sequences?

Q8. Propose a possible retro-synthesis for the following target molecules. Show forward synthesis also

(i) 

(ii) 

(iii) 

(iv) 

Section – C (10 marks each)

Q9. Describe the steps of protein synthesis, including transcription and translation. What role do tRNAs and ribosomes play in translating the genetic code into an amino acid sequence?

Q10. (a) Describe the process of solid-phase synthesis. How does it enable the rapid generation of diverse chemical libraries? Discuss its applications in peptide or small molecule synthesis.

(b) How can the Cram and Felling Ahn models be applied to predict the stereochemistry of a product in a combinatorial reaction library? Provide an example where these models might influence the design of a chiral compound library.

(c) Discuss recent advancements in the field of asymmetric hydroxylation reactions. What novel catalysts or reaction conditions have been discovered in the last decade, and how have these innovations improved the efficiency and selectivity of the hydroxylation process?

Q11. (a) How do side chain interactions (e.g., hydrogen bonding, hydrophobic interactions) influence the geometry and folding of peptides during synthesis and post-synthesis?

(b) Describe the chemical structure of NADH and NADPH. How do they differ structurally, and how does this difference relate to their respective biological functions?