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- with its significance. 1+2
- ii) What is depsi-peptide? How do you synthesize it? 1+1
- c) i) Justify PNA (Peptide Nucleic Acid) and PMO (Phosphorodiamidate Morpholino Oligomer) as nucleic acid mimic. 1+2
- ii) Give a plausible synthetic scheme for  $\gamma$ -PNA with any one of the four (A, T, G or C) nucleobases of your choice. 2
- d) Write short notes on (*any two* of the following):  $2\frac{1}{2} \times 2$
- i) Packing parameter
- ii) Ala-Scan
- iii)  $\beta$ -turn mimic
- iv) cationic liposomes

Ex/SC/CHEM/PG/CORE/TH/XVI-O/2022

**M. Sc. (CHEMISTRY) EXAMINATION, 2022**

( 4th Semester, CBCS )

**ORGANIC CHEMISTRY SPECIAL**

**PAPER – XVI-O**

Time : Two hours

Full Marks : 40

**(20 marks for each unit)**

**Use a separate answer script for each Unit.**

**UNIT: O-4161**

Answer *any four* of the following questions: 5×4

1. a) CD and NMR measurements have shown that poly-L-lysine is a random coil at pH=7 but becomes a helix as the pH is raised above 10. i) Account for this pH-dependent conformational transition. ii) Predict the pH-dependence of the helix-coil transition of poly-L-glutamate.
- b) How can you determine the total number of -S-S- (disulfide) bonds in a protein?
- c) What is glutathione? Why it contains an unusual peptide bond?  $1\frac{1}{2} + 1\frac{1}{2} + 2$
2. a) Explain the following observations (*any two*):  $1\frac{1}{2} \times 2$
- i) Amide-I and Amide-II bands of protein in FTIR spectroscopy are important in prediction of different secondary structures.

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- ii) Parallel  $\beta$ -sheets are less stable than the antiparallel  $\beta$ -sheets.
  - iii) Carboxypeptidases are not used for the determination of C-terminal amino acid sequence.
- b) 3-Bromopropyl amine reacts with cysteine side chain of a protein to form S-aminopropyl derivatives. The peptide bond on carboxyl site of the modified cysteine residues becomes susceptible to hydrolysis by trypsin. Explain with proper reason. 2
3. a) 'Collagen triple helix is very stable and has large tensile strength though it contains repeating –Gly-Pro-Hyp- triplets' – explain the formation and stability of this triple helix. Why does vitamin-C deficiency lead to denatured collagen fibres formation? 2+1
- b) Discuss the major differences between an  $\alpha$ -helix and a  $\Pi$ -helix. 2
4. a) What is  $\beta$ -turn structure in protein? How is  $\beta$ -turn structure formed?
- b) The toxin polypeptide 'apamine' is present in the venom of the honeybee. It has the amino acid sequence: CNCKAPETALCARRCQQH.
- i) It is known that 'apamine' does not react with

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- iodoacetate ( $\text{ICH}_2\text{COO}^-$ ). How many disulfide (S-S) bonds are present?
- ii) Trypsin cleavage gave two peptide fragments. Where are the S-S bonds located? Give your answer with reason. 2+3
5. a) What is Ramachandran's plot? Show the regions of allowed conformations of poly-L-alanine in this plot.
- b) What are the different protein folding accessories? Mention the role of any one of them in the folding pathway of protein. 3+2
6. a) What is circular dichroism (CD)? Mention the application of far-UV CD in the determination of secondary structure of protein. 1+2
- b) Give a brief account of **any one** of the following: 2
- i) 'Molten globule' state of a protein.
  - ii) Cyanogen bromide (CNBr) in peptide chemistry.
- UNIT: O-4162**
7. a) Design and justify a synthetic lipid as a membrane mimetic model and give a scheme for its plausible synthesis. 1+2+2
- b) i) What is pseudopeptide? Delineate the different steps involved in peptidomimetic approach

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