Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH /BT/SEM-7/BT-703A/2012-13

2012

BIOPHYSICS OF MACROMOLECULES

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The secondary amino acid present in protein is
   a) glycine b) proline
   c) lysine d) histidine.

ii) The unit of extinction coefficient is
   a) $M^{-1}cm^{-1}$ b) $M\,cm^{-1}$
   c) $M\,cm$ d) $M^{-1}cm$.

iii) Which pair of amino acids will have the highest absorbance at 280 nm ? (Assume equimolar concentrations)
   a) Thr & His b) Phe & Pro
   c) Trp & Tyr d) Phe & His.

iv) The optically inactive amino acid found in protein is
   a) glycine b) aspartic acid
   c) lysine d) histidine.

v) The approximate No. of amino acid residues present in a protein having molecular weight of 77,000 Da is

a) 700 b) 110

c) 77 d) 777.

vi) The reagent used for protein sequencing by Edmann is

a) Glycine b) Aspartic acid

c) Lysine d) Histidine.

vii) Which of the following amino acids does not contribute to fluorescence of a protein ?

a) Tyrosine b) Phenylalanine

c) Cysteine d) Tryptophan.

viii) The phenomenon of fluorescence occurs when

a) a molecule absorbs energy and moves from a ground state energy level to excited state

b) an excited molecule returns to ground state by emitting light

c) an excited molecule returns to ground state by non-radiative transition

d) a molecule collides with another molecule in the excited state.

ix) Changes in protein conformation can be detected by

a) ultraviolet absorption spectroscopy

b) fluorescence emission

c) circular dichroism

d) all of these.

x) *N*-terminal amino acids are usually determined by Sanger's method using

a) ninhydrin reagent

b) 2,4 dinitro fluorobenzene

c) hydrazine

d) concentrated nitric acid.

xi) Molecular weight of an unknown protein can be found out by

a) electrophoresis

b) ion exchange chromatography

c) affinity chromatography

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. What is the effect of following amino acids on protein structure ?

i) Proline ii) Glycine

iii) Aspartate iv) Glutamine

v) Methionine.

3. Compare *A, B* and *Z* forms of DNA.

4. What is NMR ? Briefly describe the basic principle of NMR.

1 + 4

5. What is the difference between conformation and configuration ? Describe with example.

6. Discuss the role of IR spectroscopy in determination of molecular structure.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. What do you mean by denaturation of a protein ? Derive the equation based on two-state model for melting of an alpha-helix. Discuss how the kinetic constant can be measured with the help of absorbance. 2 + 8 + 5

8. What is melting point (T_m) of a DNA ? How can T_m be determined with the help of absorbance of a DNA molecule ? Discuss the factors that affect T_m of a DNA molecule. Derive the relation between H and T_m of a DNA molecule.

2 + 4 + 5 + 4

9. a) State the working principle of X-ray crystallography and cite an example of its application.

   b) State Beer-Lambert law. When the Beer-Lambert law is not followed ? 8 + 4 + 3

10. Describe the main advantages and disadvantages of fluorescence over the optical spectorscopic techniques with suitable examples. What are Stokes and anti-Stokes shift in fluorescence ? What are intrinsic and extrinsic flurophores that are used in our biological studies ? Write a short note on FRET. 4 + 2 + 4 + 5

11. a) How many types of weak interactions are there in biomolecules ? Describe each of them with example.

    b) What do you mean by stereoisomers ? Define enantiomers and diastereomers. 10 + (1 + 2 + 2)

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