	<u>Utech</u>
Name :	A
Roll No. :	An Annual Of State Confession and State Confession
Inviailator's Signature:	

CS/B. Tech (BT)/SEM-7/BT-703A/2011-12

2011 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) In an allosteric enzyme
 - a) substrate binding site and the inhibitor binding site are the same
 - b) substrate binding site is different from the inhibitor binding site
 - c) substrate binding site may be same with the or different from inhibitor binding site
 - d) there is no inhibitor binding site.

7315 [Turn over

CS/B. Tech (BT)/SEM-7/BT-703A/2011-12

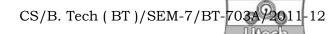


- ii) Melting point of a DNA molecule
 - a) decreases with G-C content
 - b) decreases with number of associated water molecules
 - c) increases with G-C content
 - d) independent of the above stated parameters.
- iii) Two Cys residues forming a disulphide linkage in a protein molecule
 - a) lie on the same plane
 - b) lie on different planes
 - c) lie either on the same plane or on different planes
 - d) disulphide linkage is not possible in a protein molecule.
- iv) Polyglutamic acid can form a stable alpha helix at

2

- a) physiological pH
- b) highly acidic pH (pH<4·0)
- c) highly alkaline pH (pH>11)
- d) at any pH within the pH range.

7315



- v) A combination of weak interaction is
 - a) van der Waals force, electrostatic interaction and disulphide linkage
 - b) disulphide linkage, hydrogen bonding and hydrophobic interaction
 - c) ion-dipole interaction, hydrophobic interaction and electrostatic interaction
 - d) disulphide linkage, hydrophobic interaction and van der Waals force.
- vi) Prolines are
 - a) helix stabiliser
 - b) helix destabiliser
 - c) helix breaker.
- vii) The number of bases per helical turn in Z-DNA is
 - a) 10.5

b) 12

c) 9

- d) none of these.
- viii) Glycosidic bonds are found in
 - a) DNA

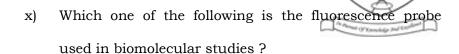
- b) RNA
- c) none of these
- d) both of these.
- ix) The diameter of a duplex DNA is
 - a) 10 Å

b) 20 Å

c) 30 Å

d) 40 Å.

CS/B. Tech (BT)/SEM-7/BT-703A/2011-12



- a) Methyl red
- b) Acridine orange
- c) β-carotene
- d) Isoprene.
- xi) Lambert-Beers law is related to
 - a) X-ray diffraction
 - b) Spectrophotometry
 - c) Electron microscope
 - d) Nuclear magnetic resonance.
- xii) The length of an α -helical polypeptide chain of 25 amino acids is
 - a) 36 nm

b) 37.5 nm

c) 40 nm

d) none of these.

GROUP - B

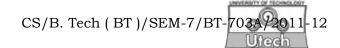
(Short Answer Type Questions)

Answer any three of the following.

$$3 \times 5 = 15$$

- 2. Describe the α -helix and β -sheet of a protein.
- $2\frac{1}{2} + 2\frac{1}{2}$
- 3) Write down the five structural differences between B- and Z- DNA.

7315



- 4) Define weak interactions. 'Weak interactions are more important than covalent linkages of stabilization of a macromolecular structure'. Do you agree with the statement? Justify your answer 2 + 3
- 5. Describe the photoconductive and piezoelectric properties of biomolecules. $2\frac{1}{2} + 2\frac{1}{2}$
- 6. What are amphipathic molecules? Discuss their interactions with water.

GROUP - C

(Long Answer Type Questions)

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

- 7. How can NMR spectroscopy be used for the structure determination of biopolymer? Describe the basic principle of circular dichroism (CD) and optical rotatory dispersion (ORD). What are negative Cotton effects and positive Cotton effects in CD and ORD? Write brief application of CD and ORD in biological macromolecules.

 5 + 5 + 2 + 3
- 8. a) Define an allosteric enzyme. Draw and explain the kinetics curve ([S] in the *X*-axis and *V* in the *Y*-axis) for an allosteric enzyme with positve cooperativity.



- b) State the postulates of symmetry model (MWC model) for explaining the properties of an allosteric enzyme. Explain the alloestric property with the help of this model. 2 + 4 + 3 + 6
- 9. Draw a diagram of a light microscope. State the differences between a light microscope and an electron microscope.
 What are the different types of electron microscopes?
 Discuss their importance in studies of biological samples.

5 + 3 + 2 + 5

- 10. a) What is the melting point of an alpha helix? Deduce the equation showing the relation between the melting point and the chain length.
 - b) What do you mean by cooperativity? Discuss the molecular basis for the positive cooperativity observed in helix coil transition. 2 + 5 + 2 + 6

CS/B. Tech (BT)/SEM-7/BT-703492011-12

- 11. a) Describe the primary, secondary, tertiary and quarternary structures of a protein.
 - b) Write down Bragg's law. How is it used in X-ray diffraction?

7315 7