



Name :

Roll No. :

Invigilator's Signature :

**CS/B.Tech(BT)/SEM-3/BT-303/2009-10
2009**

STRUCTURAL CHEMISTRY OF BIOMOLECULES

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.

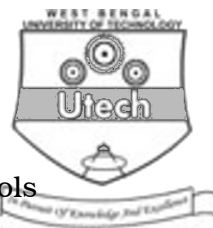
GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) The Swiss biochemist who in 1668 discovered DNA was
- a) Friedrich Miescher b) Francis Crick
- c) Alfred Hersley d) J. D. Watson.
- ii) A protein containing covalently bound sugar residues is called
- a) Glycan b) Peptidoglycan
- c) Oligo-saccharide d) Glyco-protein.
- iii) Which one is a non-protein amino acid ?
- a) Arginine b) Melanin
- c) γ -amoino butyrate d) Alanine.



- iv) Waxes are
- esters of fatty acids and fatty alcohols
 - esters of fatty acids and glycerols
 - long chain fatty acids
 - esters of cholesterol.
- v) Proline disrupts-helical structure in proteins because it is
- an acidic amino acid
 - an aromatic amino acid
 - an imino acid
 - a basic amino acid.
- vi) pK_1 represents
- the pH value at which a COOH is 50% dissociated
 - the pH value at which a NH_3^+ is 50% dissociated
 - the pH value at which the first proton is released irrespective of the group
 - none of these.
- vii) When coenzyme is covalently linked with an enzyme it is called
- cofactor
 - prosthetic group
 - apoenzyme
 - holoenzyme.
- viii) NMR is associated with
- bonding electrons
 - electron spin
 - nuclear spin
 - none of these.
- ix) A shift of absorption to a longer wavelength due to substitution is called
- bathochromic shift
 - hyperchromic shift
 - hypsochromic shift
 - hypochromic shift.
- x) The shift of protons through hydronium ion formation is known as
- proton run
 - proton hopping
 - proton movement
 - none of these.



- xi) Insulin is a
- | | |
|---------------|-------------|
| a) prohormone | b) hormone |
| c) vitamin | d) mineral. |
- xii) Z-DNA has (per turn of helix)
- | | |
|----------|-------------|
| a) 11 bp | b) 10 bp |
| c) 12 bp | d) 10.5 bp. |

GROUP – B

(Short Answer Type Questions)

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

- The sugar code is more varied than the genetic code. Justify.
- What are bulk elements ? Explain the significance of their existence as biomolecule with appropriate example.
- Distinguish between alpha helix and beta pleated sheet.
- State the rules of Watson-Crick base pairing and explain why the alternative options do not exist.
- Define a fluorophore with an appropriate example existing as biomolecule.

GROUP – C

(Long Answer Type Questions)

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

- What is the structural difference between A and B DNA ? In which part of this DNA sequence GCCATTACCAG, replication bubble would be formed and why ? What is the effect on T_m value when DNA is treated with increasing concentration of NaCl solution ? Explain. Draw the structure of ribose and deoxyribose sugar of nucleotide.
- $5 + 3 + 4 + 3$
- Write down some features of active sites of the protein. What is induced fit model ? What is the difference with lock and key model ? Draw the structure and state difference of parallel and anti-parallel beta sheet. Distinguish between tertiary and quaternary structure of protein.
- $3 + 3 + 2 + 4 + 3$



9. a) What is CD spectroscopy ? How protein folding can be studied with CD spectroscopy ? 3 + 4
- b) Monochromatic light is passed through a 1 mm path length cell containing 0.005 moles/dm³ solution. The light intensity is reduced to 16% of its value. Calculate molar extinction coefficient of the sample. What would be the transmittance if the cell path is 2 mm. 8
10. A heptapeptide was found to have an amino acid composition of asp, leu, lys, met, phe and tyr. The following information were obtained during sequencing of the peptide :
- a) Trypsin has no effect on the heptapeptide.
- b) One cycle of Edman degradation produces phenyl thiohydrantoin derivative of phenylalanine.
- c) Chymotrypsin treatment yields a dipeptide and a tetrapeptide having the following amino acid composition :
(asp, tyr) and (met, leu and lys), as well as a free amino acid.
- d) Cyanogen bromide treatment generates a dipeptide, a tetrapeptide, and free lys.
- Deduce the amino acid sequence of the heptapeptide.
Describe the lock and key model and induced fit hypothesis for explaining enzyme action. Explain why an enzyme loses its activity when treated with detergent. 8 + 4 + 3
11. What do you meant by melting point of DNA ? What is the relation between the melting point of DNA and its GC contents ? Explain why DNA is resistant to alkali hydrolysis but RNA is not. What are different non-covalent interactions are involved in maintaining the Watson-Crick double helical conformation of DNA ?
Determine the melting point of DNA, which has a total % (G + C) content value 40. 2 + 2 + 2 + 4 + 5