



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH(BT-OLD)/SEM-3/BT-303/2012-13**

**2012**

**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 )**

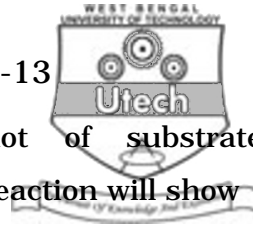
1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) In an electric field at pH 7.0, Lysine will
- a) move towards positive electrode
  - b) move towards negative electrode
  - c) stay at origin.
- ii) When coenzyme is covalently linked with an enzyme it is called
- a) cofactor
  - b) apoenzyme
  - c) prosthetic group
  - d) holoenzyme.

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[ Turn over



iii) For an allosteric enzyme, a plot of substrate concentration against velocity of the reaction will show

- a) a sigmoidal curve
- b) a straight line
- c) a parabolic curve.

iv) Lipids can be best extracted with

- a) chloroform-methanol mixture
- b) acetic acid-butanol mixture
- c) 0.1 M  $\text{PO}_4^{3-}$  buffer at pH 7.0.

v) Alpha helix is a

- a)  $10_{11}$  helix
- b)  $3_{10}$  helix
- c)  $18_5$  helix
- d)  $9_1$  helix .

vi) z DNA have

- a) 9 bases
- b) 10 bases
- c) 11 bases
- d) 12 bases per turn.

vii) All common amino acids in protein are chiral, except

- a) Alanine
- b) Glutamic acid
- c) Glutamine
- d) Glycine.

viii) The mean number of base pairs per turn in *b* DNA is

- a) 10
- b) 11
- c) 12
- d) 14.



- ix) DNA helices are structurally
- |                |                   |
|----------------|-------------------|
| a) Parallel    | b) Anti-parallel  |
| c) Intertwined | d) None of these. |
- x) The range of wavelength for visible spectroscopy is
- |                 |                  |
|-----------------|------------------|
| a) 200 - 300 nm | b) 300 - 400 nm  |
| c) 400 - 720 nm | d) 700 - 900 nm. |
- xi) The complementary of DNA sequence 5'ATTGGCA3'
- |                |                 |
|----------------|-----------------|
| a) 5'TAACCGT3' | b) 3'TAACCGT5'  |
| c) 3'ATACCTG5' | d) 5'ATACCTG3'. |

**GROUP - B**

**( Short Answer Type Questions )**

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

2. Draw and explain the titration curve of glutamic acid. The  $pK_1$ ,  $pK_2$  and  $pK_R$  values of glutamic acid are 2.2, 9.2 and 4.25 respectively. Calculate the pI. 3 + 2
3. What are the three major differences between DNA and RNA ? State two differences between A, B and Z form of DNA. 2 + 3
4. Write the principals of electron microscope. Write it's advantage over light microscope. 3 + 2
5. What is Vitamin C Why is it called as antioxidant ? 2 + 3
6. What happens when
  - a) Copper sulphate solution is added to glucose solution and the mixture is heated
  - b) Lysine is placed in the path of a plane polarized light ?

$2 \times 2 \frac{1}{2}$



**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* questions.  $3 \times 15 = 45$

7. All the enzymes are proteins but all the proteins are not enzymes. Is the statement true ? Justify your answer. 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. What do you mean by product inhibition ?  $3 + 5 + 5 + 2$

8. What are two major structural studies of DNA, on the basis of which Watson and Crick proposed the double helix model of DNA ?

Describe the features of Watson-Crick double helix model of DNA with a diagram. What is apurinic acid ? How can you get it in Laboratory ?

Calculate the length of a double stranded DNA molecule of molecular weight  $3 \times 10^7$ . The average molecular weight of a nucleotide pair is 660. How many helical turn does a molecule of this DNA contain ?  $2 + 6 + 2 + 5$

9. Define allosteric enzyme. Why is it known as biocatalysts ? Explain the lock-key model of enzyme. What is omega loop ?  $2 + 4 + 5 + 4$

10. a) Derive Bragg's equation for X-ray diffraction.  
b) Draw the sketch NMR spectra of the compound  $\text{CH}_3\text{CH}_2\text{CH}_3$  and explain.  
c) What is Lambert-Beer Law ? What is its limitation ?

$5 + 6 + 4$

