Name :	Uneran	
Roll No. :	An Promised Of Exercising and Excellent	)
Invigilator's Signature :		

# CS/B.TECH(BT-OLD)/SEM-3/BT-303/2011-12

## 2011

# 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 :

 $10 \times 1 = 10$ 

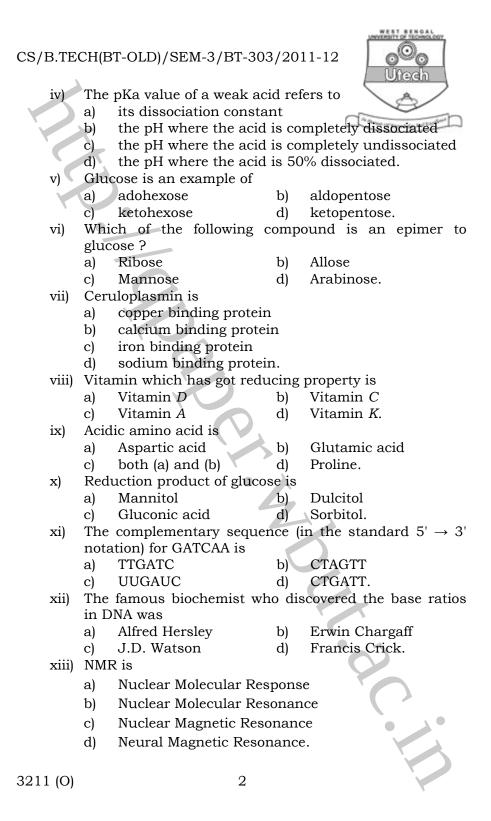
- i) The equation relating pH and pKa of a solution is known as
  - a) Helmoltz equation
  - b) Henderson equation
  - c) Gibbs Duhem equation
  - d) Carnot equation.
- ii) The molecules which are mirror image to each other are called
  - diastereoisomer b) mesomer
  - isomer d) enantiomer.
- iii) Benzene is converted to nitrobenzene by a mixture of  $H_2SO_4$  and  $HNO_3$ . The catalyst for this reaction is
  - a) the nitronium ion b)  $HNO_3$
  - c) the sulphonium ion d)  $H_2SO_4$ .

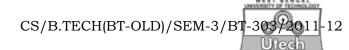
3211 (O)

a)

c)

[ Turn over





#### GROUP – B

### (Short Answer Type Questions)

Answer any *three* of the following.  $3 \times 5 = 15$ 2. Draw the structures of a non-protein amino acid and a modified amino acid. State the two differences between them. 2 + 3

- 3. a) What is nulcein and who discovered it ?
  - b) Write two chemical structure-differences between DNA and RNA.
  - c) Write the chemical structure of (i) phosphoric acid, (ii) ribose and deoxyribose, (iii) adenine and cytosine.

 $1 + 1\frac{1}{2} + 2\frac{1}{2}$ 

- Write the structures of (a) tryptophan (b) Glucose (c) ATP (d) Palmitic acid (e) Deoxyribose (Haworth projection formula).
- 5. Calculate pKa of lactic acid, when the concentration of lactic acid is 0.01 M, concentration of lactate is 0.087 M and the pH is 4.8. Calculate the isoelectric point of Glutamicacid, given  $pK_1=2.19 pK_2 = 9.67$ ,  $pK_R=4.8$ . 3+2
- 6. What do you mean by secondary structure of a protein molecule ? Name the two major forms of secondary structure found in proteins. Length of an alpha-helix is 97.5 A. Calculate the number of amino acid residues present in the helix. 2 + 1 + 2
- 7. a) State Chargaff's equivalence rule.

What happens when :

b) In a sample of DNA isolated from a species of bacteria which contain  $15 \cdot 1$  % adenine of the total bases on a molar basis. What are the percentage of the other bases present ? 2 + 3

#### GROUP - C

#### (Long Answer Type Questions)

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

5 × 3

- a) Ninhydrin is added to an amino acid solution
- b) Glucose is heated with alkaline copper sulfate solution
- c) Glucose is treated with potassium dichromate and sulfuric acid
- d) Cholesterol is treated with ferric chloride in presence of acetic acid and sulfuric acid
- e) Albumin solution is heated for ten minutes.

3211 (O)

8.

3

[ Turn over

CS/B.TECH(BT-OLD)/SEM-3/BT-303/2011-12



- 9. Define enzyme, co-enzyme, co-factor with proper examples. All the enzymes are proteins but all proteins are not enzymes. Justify the statement. What are competitive and non-competitive inhibitors ? 6+5+4
- 10. A fatty acid is represented as  $18:1^{\Delta 9}$ . What information do you get about its structure ? Define : iodine number, saponification number and acid number. What is rancidity ? How does rancidity develop ? How can a fat sample be preserved from rancidity ? 3+6+2+2+2
- 11. a) What are the major structural studies of DNA, on the basis of which Watson and Crick proposed the double helix model of DNJA ?
  - b) Describe the features of Watson & Crick double helix model of DNA with a diagram.
  - c) What is apurinic acid ? How you can get it in laboratory ?
  - d) 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

12. What is an electron microscope ? Write the differences of an electron microscope from a light microscope. Draw a representative diagram of an electron microscope. Discuss the importance of an electron microscope in study of biological samples. 2+6+7

4

3211 (O)