Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH /BT(N)/SEM-3/CH(BT)-302/2012-13

2012

CHEMISTRY – II

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 chemical bond present in all proteins is

a) Phosphodiester bond b) Peptide bond

c) Glycosidic bond d) N_2 bond.

ii) Which of the following amino acids is unable to form proper peptide bond ?

a) Valine b) Cysteine

c) Arginine d) Proline.

iii) The length of α-helical section of a polypeptide chain of 20 residues would be

a) 30 Å b) 20 Å

c) 5·4 Å d) 3·6 Å.

iv) For a double stranded DNA, which of the following statements is wrong ?

a) A/T ratio is constant

b) G is always equal to C

c) $A + T = G + C$

d) $(A + G) / (C + T)$ ratio is constant.

v) Bathochromic effect is

a) shift of absorption band to shorter wavelength

b) shift of absorption band to longer wavelength

c) absorption band remain as it is

d) none of these.

vi) Of the following strands of DNA, in combination with their complement in the form of a double helix, three undergo a hyperchromic (DNA denaturing) shift with a T_m (melting temperature) of about 42°C. One has a T_m of 52°C. Which one ?

a) TCATGCGATC b) CTTAAATTTG

c) TAACTACGAA d) AAATTTGGGA.

vii) What were the final two pieces of data that were crucial to Watson and Crick's proposed structure of DNA ?

a) Base composition analysis and hydrogen bonding

b) *X*-ray diffraction and the nucleoside structure

c) *X*-ray diffraction and base composition analysis

d) The discovery of the four nucleotides and nucleoside structure.

viii) Stigmasterol is a

a) lipid b) carbohydrate

c) protein d) vitamin.

ix) Lipid can be best extracted with

a) chloroform-methanol mixture

b) acetic acid-butanol mixture

c) 0·1 M PO_4^{3-} buffer at pH 7

d) 0·1 M HCl.

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) Thiamin is

a) vitamin *A* b) vitamin *C*

c) vitamin B_1 d) vitamin *K*.

xii) Cell membrane bilayer consists of

a) protein only b) protein and lipid

c) lipid only d) none of these.

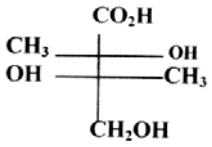
GROUP – B

(Long Answer Type Questions)

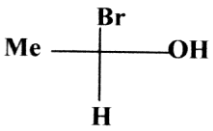
Answer any *five* questions taking at least *one* from each Module. 5 × 12 = 60

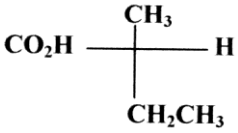
MODULE – 1

2. a) Write the structure of the following compound in Newmann and Saw Horse configuration :



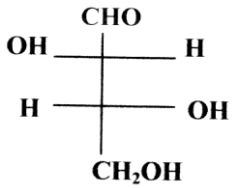
b) Assign R/S nomenclature to the following compounds :

i) 

ii) 

c) Write down the conformation of *D*-glucose in Fischer and Haworth Projection formulae.

d) Assign D/L nomenclature to the following compound with justification :

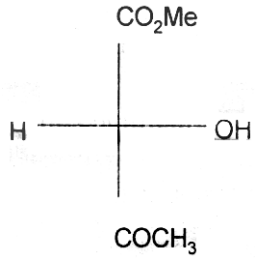


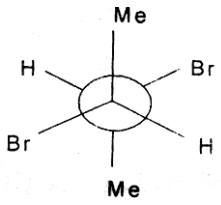
e) What are the applications of ultraviolet spectroscopy ?

f) On passing monochromatic light through a 0·01(M) solution in a cell of 1 cm thickness, the intensity of the transmitted light was reduced to 10%. Calculate the molar extinction coefficient. 6 × 2

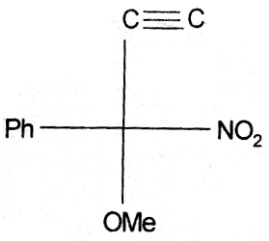
3. a) Designate R/S : 4×2

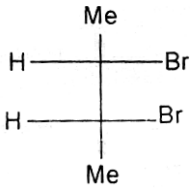
i) ii)





iii) iv)





b) An aliquot of a solution containing substance at a concentration of 5 g dm^{-3} was placed in a 2 cm cuvette. The cuvette was placed in a spectrophotometer and a beam of light was passed through the cuvette containing the solution. A transmission value of 80% was recorded. Find the absorbance of the solution. 4

MODULE – 2

4. a) What is the difference between sucrose and lactose ?

b) Why human cannot digest cellulose ? What is lactose intolerance ?

c) Why most unsaturated fatty acids found in phospholipids are in 'cis' rather than 'trans' configuration ?

d) Define rancidity and iodine value. 3 + 3 + 2 + 4

5. a) How do you prove that the structure of glucose is $OHCCHOHCHOHCHOHCHOHCH_2OH$?

   b) What happens when glucose is treated with the following ?

   (i) Nitric acid, (ii) Hydrogen with nickel catalyst, (iii) HCN followed by hydrolysis.

   c) What are steroid and non-steroid hormones ? Describe different types of hormonal receptor. 3 + 3 + (2 + 4)

MODULE – 3

6. What do you mean by nucleotide & nucleoside ? What do you mean by triple helical DNA ? What do you mean by hyperchormism ? The *E.coli* chromosome has a size of approximately 4000 kB. What length of DNA (*B* form) would be contained in it ? In 5'ATGCCCGTT3' what will be the sequence of its corresponding antisense mRNA ?

   2 + 2 + 2 + 3 + 3

7. a) A 10 ml crude extract of a protein solution was diluted to 1000 ml. The A280 and A260 value for the diluted protein were 0·25 and 0·075 respectively. Calculate the concentration of protein in the crude extract.

   b) Write the names of different forms of secondary structures of protein.

   c) Describe the alpha helix structure of a polypeptide with diagram.

   d) Write the differences between alpha helix and beta sheet structure of protein. 2 + 2 + 4 + 4

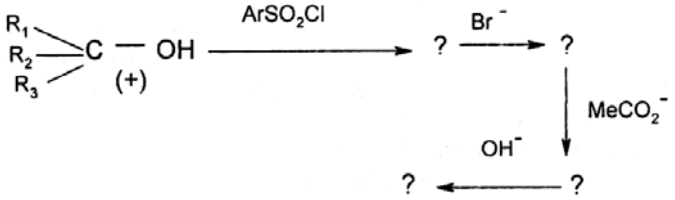
MODULE – 4

8. a) Write down the differences between S_N^1 and S_N^2 reactions.

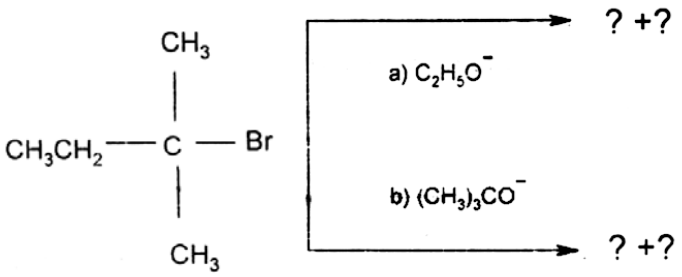
   b) What will be the product when phenyl methyl ketone is treated with hydroxylamine by acidification ? Write the mechanism.

   c) What is biopolymer ? What is nanotechnology and what are the materials used in nanotechnology ? 4 + 4 + 4

9. a) Complete the following reaction mentioning the nature of optical activity in each step.



   b) Write down the major and minor products of the following reactions.



8 + 4

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