AT–327

B.Sc. (Part—II) Semester—III Examination

3S : CHEMISTRY

Time : Three Hours] [Maximum Marks : 80

Note :— (1) Question No. **1** is compulsory.

(2) Solve ***one*** question from each unit.

(3) Draw well labelled diagram and give equation wherever necessary.

(4) Use of calculator is allowed.

1. (a) Fill in the blanks :

(i) BMO has ..... energy than the corresponding AOs from which it is formed.

(ii) A solution with known concentration is termed as .....

(iii) The actual arrangement of atoms in a space of optical active compound is called as ..... configuration.

(iv) The SI unit of equivalent conductance is 2

(b) Choose the correct alternative :

(i) The total number of confirmation of ethane are .....

(a) 2

(b) 3

(c) 4

(d) 6

(ii) The number of gram moles of solute dissolved to make one kilogram of solvent is called .....

(a) As Normality

(b) As Molality

(c) As Molarity

(d) As Mole Fraction

(iii) The total number of molecular orbitals formed in He_2 molecule are .....

(a) Two

(b) Three

(c) Four

(d) Five

(iv) Cell constant is the ratio of specific and ..... conductances.

(a) Equivalent

(b) Molar

(c) (a) and (b) both

(d) Observed 2

(c) Answer the following in one sentence :

(i) State the physical significance of Helmholtz free energy.

(ii) Define Enantiomers.

(iii) State Kohlrausch's law.

(iv) Draw the bond structure of carboxylic group. 4

UNIT—I

2. (a) On the basis of MOT, explain the structure of O_2-molecule. 4

(b) Give the difference between bonding molecular orbitals and anti-bonding molecular orbitals. 4

(c) Discuss the shape of SF_6 molecule on the basis of VSEPR theory. 4

OR

3. (p) Give the free electron theory to explain the metallic bond and the properties of metals. 4

(q) What are the postulates of MOT ? 4

(r) Explain the molecular orbital structure of co-molecule by Coulson. 4

UNIT—II

4. (a) Give the classification of volumetric titration. Explain acid-base titration with suitable example. 4

(b) Calculate the mole fraction of ethanol and water if solution contains 6 moles of ethanol and 3 moles of water. 4

(c) Discuss the following steps involved in gravimetric estimation of Barium as Barium Sulfate :

(i) Digestion

(ii) Incineration. 4

OR

5. (p) Define the following terms :

(i) Titrant

(ii) Indicator

(iii) Equivalence point

(iv) Molality. 4

(q) Differentiate between co-precipitation and post-precipitation. 4

(r) Calculate normality and molarity of $2dm^3$ of solution containing 12g of $MgSO_4$ (Mol. wt. of $MgSO_4$ = 120). 4

UNIT—III

6. (a) Give the reaction and mechanism of Perkin Reaction. 4

(b) How will you prepare ?

(i) Benzoic acid from toluene

(ii) Oxalic acid from ethylene glycol. 2×2=4

(c) Explain structure and acidity of carboxylic acid. 4

OR

7. (p) What is Cannizzaro's reaction ? Discuss in detail. 4

(q) Give the preparation of acetaldehyde from ethyl alcohol and ethylidene dichloride. 4

(r) What happens when :

(i) Benzamide is hydrolysed with NaOH, followed by acidification

(ii) Benzoic acid is treated with C_2H_5OH and conc. H_2SO_4 ? 4

UNIT—IV

8. (a) Explain E-Z system of nomenclature with an example. 4

(b) Why chair confirmation of cyclohexane is more stable than boat conformation. 4

(c) Describe the terms :

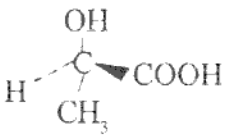
(i) Resolution by chemical method

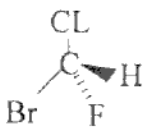
(ii) Racemisation. 4

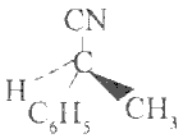
OR

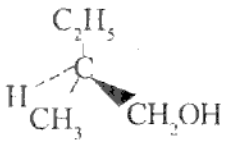
9. (p) Explain the conformations of n-butane with energy level diagram. 4

(q) Assign whether the following compounds are of 'R' or 'S' form :

(i) 

(ii) 

(iii) 

(iv) 

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(r) What is geometrical isomerism ? Explain with suitable example. 4

UNIT—V

10. (a) Explain the application of Nernst distribution law to calculate degree of association of solute. 4

(b) What is Gibb's free energy ? Derive the equation of change in Gibb's free energy. 4

(c) What are partially miscible liquids ? Draw and explain the phase diagram of phenol-water system. 4

OR

11. (p) Derive the Gibb's Duhem equation. 4

(q) The equilibrium constant (K_p) for the reaction $H_2(g) + S(g) \rightleftharpoons H_2S(g)$ is 20.2 atm at 945°C and 9.21 atm at 1065°C. Calculate the heat of reaction ($R = 8.134\ JK^{-1}$). 4

(r) Derive Van't Hoff reaction isotherm equation. 4

UNIT—VI

12. (a) What are the different applications of viscosity measurements ? 4

(b) Define :

(i) Equivalent conductance

(ii) Transport number. 4

(c) Explain with graph the conductometric titrations :

(i) HCl against NaOH

(ii) $AgNO_3$ against KCl. 4

OR

13. (p) Explain the moving boundary method to determine transport number. 4

(q) Define :

(i) Specific conductance

(ii) Cell constant. 4

(r) Water required 120.5 seconds to flow through a viscometer and the same volume of acetone required 49.5 seconds. If the densities of water and acetone at 293 K are $9.982 \times 10^2\ kgm^{-3}$ and $7.92 \times 10^2\ kgm^{-3}$ resp. If the co-efficient of viscosity of water at 293 K is 10.05 Pascal second, calculate the co-efficient of viscosity of acetone at this temperature. 4