AR – 537

Third Semester B. Sc. (Part – II) Examination

3S : CHEMISTRY

P. Pages : 8

Time : Three Hours] [Max. Marks : 80

Note : (1) Question No. **one** is compulsory.
(2) Solve **one** question from each unit.
(3) Draw well labeled diagram and give equation wherever necessary.
(4) Use of calculator is allowed.

1. (A) Fill in the blanks :—

(i) Mathematical equation of Helmholtz's free energy is ------ .

(ii) In carbonyl group (>C = O) the carbon and oxygen are in ------ hybridised state.

(iii) Enantiomers have ------ imposable mirror images relationship.

(iv) The surface tension of liquid ------ with increase of temperature. 2

(B) Choose the correct alternative :—

(i) For spontaneity of chemical reaction, the value of ΔG should be ------ .

(a) positive

(b) negative

(c) zero

(d) none of these.

(ii) The bond angle H-N-H in NH_3 molecule is ----

(a) 109.5^0

(b) 104.5^0

(c) 107.5^0

(d) 102^0

(iii) Phenolphthalein is suitable indicator for pH range of ------- .

(a) 3.2 to 4.5

(b) 4.4 to 6.5

(c) 5.5 to 7.5

(d) 8.4 to 10.5

(iv) The SI unit of molar conductance is -----

(a) Sm^{-1}

(b) Sm^2mol^{-1}

(c) Sm^2 $equi^{-1}$

(d) ohm^{-1}. 2

(C) Answer the following in **one** sentence :—

(i) What is α-hydrogen atom ?

(ii) What are optically active compounds ?

(iii) Define the bond order.

(iv) What are immiscible liquids ? Give an example. 4

UNIT I

2. (a) On the basis of MOT, describe structure of N_2 molecule. 4

(b) Discuss band theory taking example of Li . 4

(c) Discuss the structure of H_2O on the basis of VSEPR theory. 4

OR

3. (p) Explain the structure of $SnCl_2$ on the basis of VSEPR Theory. 4

(q) Describe the bands in conductors and insulator. 4

(r) Draw the molecular orbital energy level diagram for NO. Calculate its bond order. 4

UNIT II

4. (a) Distinguish between Gravimetric and volumetric analysis. 4

(b) Calculate the molarity and normality of a solution containing 4.9 g of H_2SO_4 in 500 cc water. (Mol. Wt H_2SO_4 = 98). 4

(c) Explain (i) Co-precipitation and
(ii) Post-precipitation ? 4

OR

5. (p) Explain internal and external indicator in redox titration. 4

(q) Calculate the weight of KOH required to prepare 0.2 M 500 cc solution.
(Mol. wt. of KOH=56) 4

(r) Discuss the choice of indicator in strong acid with strong base. 4

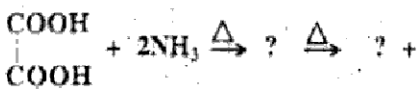
UNIT III

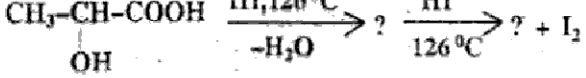
6. (a) Give the following reactions :—

(i) Clemmensen reduction of acetaldehyde.

(ii) Wolf-krishner reduction of acetophenone. 4

(b) Complete the following reactions :—

(i) 

(ii) 

4

(c) What happens when salicyclic acid is treated with-

(i) Acetyl chloride in presence of phosphoric acid.

(ii) Methanol and concentrated sulphuric acid. 4

OR

7. (p) Explain Aldol condensation in aldehydes and ketones with example. 4

(q) What is Perkin reaction ? Give its mechanism. 4

(r) Give the detail of following :—

(i) Friedel-Craft-reaction

(ii) Gattermann-Koch reaction. 4

UNIT IV

8. (a) Explain the Baeyer's strain theory and give its limitations. 4

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

(c) Explain the terms :-

(i) Chirality (ii) Racemization 4

OR

9 (p) What are the sequence rules for R and S configuration. 4

(q) Explain Cis-trans isomerism with an example. 4

(r) Explain the conformations of ethane with energy level diagram. 4

UNIT V

10. (a) Explain the variation of Gibb's free energy with pressure and temperature. 4

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

(c) An aqueous 0.1 dm^3 solution of organic compound contains 0.01 kg of compound. It is extracted in five installments of 0.02 dm^3 each of ether. It the partition co-efficient is 5 in favour of ether, calculate the amount extracted. 4

OR

11. (p) Derive the equation for chemical potential of an ideal gas in a gaseous mixture. 4

(q) The free energy change (ΔG) for the reaction $2Ag + Hg_2Br_2 \longrightarrow 2AgBr + 2Hg$ is found to be -13129.39J at 300 k and $\left[\frac{d\Delta G}{dT}\right]_p$ for it is -60.207 $J\,deg^{-1}$. Find ΔH for the reaction at 300 k. 4

(r) Explain the physical significance of the Helmholtz free energy change. 4

UNIT VI

12. (a) Define the terms (i) Transport number
(ii) Molar conductance

(b) Explain the determination of viscosity by Ostwald's viscometer method. 4

(c) Equivalent conductance for 0.01N acetic acid at 15 ^{0}C is 16.30 sm^2 $equiv^{-1}$ and equivalent conductance at infinite dilution for the same acid is 364 sm^2 $equiv^{-1}$. Calculate the degree of dissociation and dissociation constant for acid. 4

OR

13 (p) Explain the determination of λ_∞ of weak electrolytes by using Kohlrausch's law. 4

(q) Explain the variation of specific and equivalent conductance with dilution. 4

(r) Explain the drop number method for determination of surface tension of liquid. 4