

**B.Sc. Part-II Semester—III Examination**  
**CHEMISTRY**

Time : Three Hours]

[Maximum Marks : 80

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

(2) Solve one question from each unit.

(3) Draw diagrams and give equations wherever necessary.

(4) Use of scientific calculator is allowed.

1. (a) Fill in the blanks :

(i) The substances having intermediate properties between conductors and insulators are called \_\_\_\_\_.

(ii) The titration in which one reactant is oxidized and the other is reduced is known as \_\_\_\_\_ titration.

(iii) The compounds with same molecular formula but having different functional groups are called \_\_\_\_\_.

(iv) The resistance to flow of liquid is called \_\_\_\_\_. 4 × ½ = 2

(b) Choose the correct alternatives :

(i) Racemic compounds are :

(a) Dextrorotatory

(b) Laevorotatory

(c) Optically inactive

(d) All of these

(ii) Bond order in case of CO molecule :

(a) Two

(b) Three

(c) Four

(d) One

- (iii) The correct sequence of acidity of different isomers of Nitrobenzoic Acid (NBA) is :
- (a) ortho > para > meta                      (b) ortho > meta > para  
 (c) para > meta > ortho                      (d) para > ortho > meta
- (iv) On increasing the temperature, viscosity of liquid :
- (a) Increases  
 (b) Decreases  
 (c) First decreases, then increases  
 (d) None of them 4 × ½ = 2
- (c) Answer the following in **one** sentence :
- (i) What is standard solution ?  
 (ii) What are optically active compounds ?  
 (iii) What are immiscible liquids ?  
 (iv) What is racemisation ? 4

### UNIT—I

2. (a) Draw MO diagram of N<sub>2</sub> molecule and explain paramagnetic nature of N<sub>2</sub> molecule. 4  
 (b) What are conductors ? How they differ from insulator ? 4  
 (c) Explain the structure of IF<sub>7</sub> molecule on the basis of VSEPR theory. 4

### OR

3. (p) On the basis of molecular orbital diagram of NO molecule explain :  
 (i) Bond order  
 (ii) Magnetic nature. 4
- (q) What is free electron theory of metallic bonding ? Explain. 4  
 (r) With the help of VSEPR theory explain the geometry of SnCl<sub>2</sub>. 4

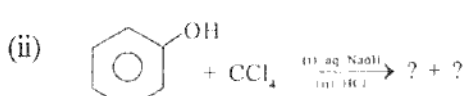
## UNIT—II

4. (a) Define :
- (a) Molarity
  - (b) Normality
  - (c) Molality
  - (d) Mole fraction. 4
- (b) What is redox titration ? Calculate the equivalent weight of  $K_2Cr_2O_7$  in acid medium. (At. Wt. of K = 39, O = 16 and Cr = 52). 4
- (c) Explain the terms :
- (i) Co-precipitation
  - (ii) Post-precipitation. 4

## OR

5. (p) Explain the variation of pH for titration between HCl and NaOH. 4
- (q) Explain the terms :
- (i) Digestion
  - (ii) Incineration.
- in gravimetric estimation of  $Ba^{2+}$  as  $BaSO_4$ . 4
- (r) Calculate the normality and molarity of a solution containing 4.0 gms of NaOH in 500 ml solution. [Molecular wt. of NaOH = 40] 4

## UNIT—III

6. (a) How will you prepare the following compounds ?
- (i) Acetaldehyde from acetylene
  - (ii) Oxalic acid from cyanogen 2×2=4
- (b) Complete the following reactions :
- (i) 
$$CH_3 - \overset{OH}{\underset{|}{CH}} - COOH \xrightarrow[-H_2O]{HI, 126^\circ C} ? \xrightarrow{HI, 126^\circ C} ? + I_2$$
  - (ii)  
$$C_6H_5OH + CCl_4 \xrightarrow[(-HCl)]{(+ aq. NaOH)} ? + ?$$
 2×2=4

(c) What happens when :

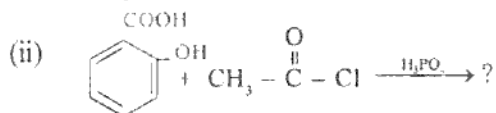
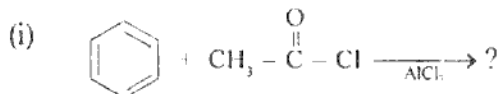
(i) Ethyl benzene is reacted with  $V_2O_5$  at  $500^\circ\text{C}$  in presence of  $O_2$

(ii) Benzaldehyde is heated with aqueous-alcoholic KCN ?

2×2=4

OR

7. (p) Complete the following reactions :



2×2=4

(q) Explain why, Chloroacetic acid is stronger than acetic acid ?

4

(r) Explain the mechanism of Perkin's reaction.

4

#### UNIT—IV

8. (a) Define the following terms :

(i) Dextro isomer

(ii) Laevo isomer.

2×2=4

(b) Arrange the following groups in proper priority order according to R-S nomenclature system :

(i)  $-\text{C}_2\text{H}_5$ ,  $-\text{OH}$ ,  $-\text{H}$ ,  $-\text{COOH}$

(ii)  $-\text{CHO}$ ,  $-\text{COOH}$ ,  $-\text{NH}_2$ ,  $-\text{OH}$ .

2×2=4

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

4

OR

9. (p) Define and explain with suitable example :

(i) Enantiomers

(ii) Plane of symmetry.

2×2=4

(q) Explain the conformational analysis of ethane with energy level diagram.

4

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

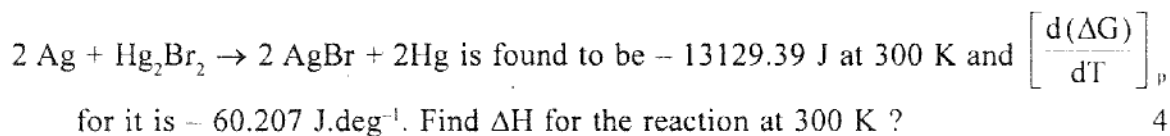
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## UNIT—V

10. (a) Derive Gibb's-Duhem equation. 4  
 (b) Discuss phenol-water system with well labelled phase diagram. 4  
 (c) In the distribution of succinic acid between ether and water at 15°C, 20 ml of the ether layer contains 0.092 g of the acid. Find out weight of the acid present in 50 ml of the aqueous solution in equilibrium with it if the distribution co-efficient of succinic acid between water and ether is 5.2. 4

## OR

11. (p) Derive Van't Hoff reaction isotherm. 4  
 (q) Deduce the equation for distribution law in case of association of solute in one of the phase. 4  
 (r) The free energy change ( $\Delta G$ ) for the reaction :



## UNIT—VI

12. (a) Define :  
 (i) Surface tension  
 (ii) Coefficient of viscosity.  $2 \times 2 = 4$   
 (b) Explain variation of specific and equivalent conductance with dilution. 4  
 (c) A conductivity cell was filled with  $0.01 \text{ M KCl}$  which was  $99.3 \text{ ohm}$ . When the cell was filled with  $0.02 \text{ M AgNO}_3$ , the resistance was  $50.3 \text{ ohm}$ . Calculate (i) Cell constant and (ii) Specific conductance of  $\text{AgNO}_3$  solution. 4

## OR

13. (p) Define the terms :  
 (i) Transport number  
 (ii) Molar conductance.  $2 \times 2 = 4$   
 (q) Explain the drop number method for the determination of surface tension of liquid. 4  
 (r) Equivalent conductance for  $0.01 \text{ N}$  acetic acid at  $15^\circ\text{C}$  is  $16.30 \text{ S m}^2 \text{ equiv}^{-1}$  and equivalent conductance at infinite dilution for the same acid is  $364 \text{ S m}^2 \text{ equiv}^{-1}$ .  
 Calculate the degree of dissociation and dissociation constant for acid. 4

