13. (p) How relative viscosity of liquid is determined by Ostwald's Viscometer method. 4

(q) Discuss the Kohlrauskh's law of independent migration of ions. 4

(r) At 25°C the transport number of $H^+$ ion in HCl and $CH_3COO^-$ ion in $CH_3COONa$ are 0.81 and 0.47 respectively. The equivalent conductance at infinite dilution of HCl and $CH_3COONa$ are 426 $ohm^{-1}.cm^2. equivt^{-1}$ and 91.0 $ohm^{-1}.cm^2. equivt^{-1}$ respectively. Calculate the equivalent conductance of acetic acid at infinite dilution. 4

**AQ—675**

**B.Sc. (Part–II) Semester–III Examination**
**3S : CHEMISTRY (New)**

Time : Three Hours]    [Maximum Marks : 80

N.B. :— (1) Question No. 1 is compulsory.

(2) Solve ONE question from each Unit.

(3) Draw diagram and give equations wherever necessary.

(4) Use of calculator is allowed.

1. (A) Fill in the blanks :-

(i) The shape of $PCl_5$ molecule is _____.

(ii) The titration in which one reactant is oxidised and the other is reduced is known as _____.

(iii) β-Hydroxy aldehyde or β-Hydroxy ketone is called _____.

(iv) For 'n' moles of gas an ideal gas equation is _____.    $4 \times \frac{1}{2} = 2$

(B) Choose the correct alternative :-

(i) The property of metals to form thin sheets on hammering is called :

(a) Metallic character

(b) Ductility

(c) Malleability

(d) Metallic lustre

(ii) LiAlH$_4$ reduces carbonyl compounds into :

    (a) Hydrocarbons

    (b) Alcohols

    (c) Acids

    (d) Esters

(iii) The hybridization of carbon and oxygen atoms in carbonyl group is :

    (a) $sp^3$

    (b) $sp^2$

    (c) $sp$

    (d) $dsp^2$

(iv) The upper critical solution temperature of phenol water system is :
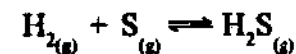
    (a) 67.8 °C

    (b) 68.1 °C

    (c) 68.7 °C

    (d) 67.9 °C           $4 \times \frac{1}{2} = 2$

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

    (i) What is an indicator ?         1

    (ii) What is configuration ?         1

    (iii) What is Phase transition ?         1

    (iv) What is conductometric titration ?     1

(c) The equilibrium constant K$_p$ for the reaction :

$$H_{2(g)} + S_{(g)} \rightleftharpoons H_2S_{(g)}$$

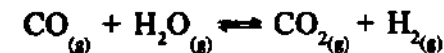is 20.2 atm at 1218 K and 9.21 atm at 1338 K. Calculate the heat of reaction.     4

**OR**

11. (p) Deduce the equation for distribution law in case of association of solute in one of the phase.     4

    (q) Prove : $\left(\dfrac{dG}{dP}\right)_T = V$ and $\left(\dfrac{\delta G}{dT}\right)_P = -S$.     4

    (r) The value of K$_p$ for the water gas reaction :

$$CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$$

is $1.06 \times 10^5$ at 298 K. Calculate the standard free energy change ($\Delta G°$) of the reaction at 298 K. ($R = 8.314$ J K$^{-1}$ mol$^{-1}$).     4

**UNIT—VI**

12. (a) Give the four applications of each surface tension and viscosity.     4

    (b) Define the following terms :

        (i) Transport Number
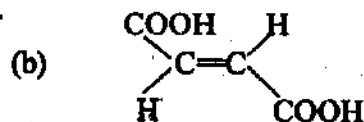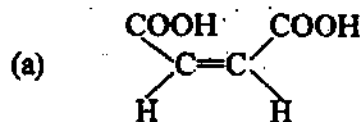
        (ii) Equivalent Conductance.     4

    (c) How can you determine the equivalent conductance of electrolyte solution by Wheatstone Bridge method ?     4

**OR**

(q) (i) Assign the Cis-trans nomenclature to the following compounds :

(a) 
$$\begin{matrix} COOH & COOH \\ & >C=C< \\ H & H \end{matrix}$$

(b) 
$$\begin{matrix} COOH & H \\ & >C=C< \\ H & COOH \end{matrix}$$  2

(ii) Arrange the following groups in proper priority order according to 'R' & 'S' nomenclature system :

(a) —COOH, NH$_2$, —H, —CH$_3$

(b) —C$_2$H$_5$, —OH, —H, —CH$_3$.    2

(r) Draw Newman and Sawharse projection formulae for ethane molecule.    4

### UNIT—V

10. (a) Derive Gibbs-Helmholtz equation and name the applications.    4

(b) Define the following terms :

(i) Partition co-efficient

(ii) Multiple Extraction.    4

### UNIT—I

2. (a) How do Molecular orbitals differ from Atomic Orbitals ?    4

(b) Give the properties of metals on the basis of free electron theory.    4

(c) On the basis of VSEPR theory explain the structure and shape of BF$_3$ molecule.    4

### OR

3. (p) What is meant by bond order ? Does it relate to bond strength ?    4

(q) What are conductors and isulators ? What is the condition for conduction of electricity ?    4

(r) In CH$_4$ tetrahedral angle is 109°. While in NH$_3$ and H$_2$O it is reduced to 107° and 105° respectively. Explain with reasons.    4

### UNIT—II

4. (a) Discuss the following steps involved in gravimetric estimation of Barium as BaSO$_4$ :

(i) Precipitation

(ii) Digestion.    2×2

(b) Define the following terms :

(i) Titrant

(ii) Standard solution

(iii) Equivalence point

(iv) Molality    4

(c) Calculate the molarity and normality of a solution containing 2.0 gms of NaOH in 500 ml solution. (Mol. wt. of NaOH = 40)     4

**OR**

5. (p) Write a note on Iodometry and Iodimetry.     4

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

   (r) Discuss choice of indicators in the following acid base titration :

     (i) Strong acid strong base

     (ii) Weak acid strong base.     2×2

### UNIT—III

6. (a) How will you prepare acetaldehyde from :

     (i) Ethyl alcohol

     (ii) Acetylene ?     4

   (b) What happens when :

     (i) Isopropyl alcohol is treated with acidic potassium dichromate solution.

     (ii) Ethyl benzene is reacted with Vanadium pentaoxide at 500°C in presence of oxygen.     4

(c) (i) How will you prepare Salicylic acid from phenol ?

     (ii) How will you prepare Benzoic acid from Phenyl Cyanide ?     4

**OR**

7. (p) What is Clemmenson reduction ? Explain with suitable example.     4

   (q) Write a note on Wolf-Krishner reduction giving suitable reactions.     4

   (r) (i) What is the action of $PCl_5$ on Lactic Acid ?

     (ii) What is the action of $NH_3$ on benzoic acid ?     4

### UNIT—IV

8. (a) What is chain isomerism ? Explain it in alkanes taking suitable examples.     4

   (b) Define and explain the following terms :

     (i) Asymmetric-C-atom

     (ii) Enantiomers.     4

   (c) What is geometrical isomerism ? Explain with suitable examples.     4

**OR**

9. (p) Explain the following :

     (i) Plane of symmetry

     (ii) Centre of symmetry.     4