

N.B. : 1) All questions are compulsory

2) Figures to the right indicate full marks.

3) Use of log tables/non-programmable calculator is allowed.

4) Answers to two sections should be written in same answer book.

SECTION - I

- Q 1. A State any three applications of Clapeyron Clasius equation. 3
B Attempt any **three** of the following :-
i Write a note on Gibb's Duhem equation. 4
ii Derive thermodynamic derivation of equilibrium constant. 4
iii For the equation $2\text{SO}_{2(g)} + \text{O}_{2(g)} = 2\text{SO}_{3(g)}$ $K = 42.9$ at 900K.
Calculate standard Free energy change (ΔG°) of the reaction at 900 K.
($R = 8.314 \text{ J/mol/K}$). 4
iv Derive the relation of Van't Hoff's reaction Isochore. 4
v Derive the reaction between K_p and K_c . 4
- Q2. A Define the term equivalence conductance and mention it's unit. 3
B Attempt any **three** of the following :-
i Explain the variation of molar conductance with concentration. 4
ii State and explain any two applications of Kohlraush's Law of independent migration of ions. 4
iii Write a note on determination of transport number by Hittorf's method. 4
iv Write a note on relation between ionic conductance and ionic mobility. 4
v Transport number of K^+ in 1 N KCl was determined by moving boundary method, with BaCl_2 as the following electrolyte. A current of 0.0142 Amperes was passed through the solution for 1675 seconds. In the same time interval, the boundary swept a volume of 0.1205 cm^3 . Calculate the transport number of K^+ . ($F = 96500 \text{ Coulomb}$). 4
- Q3. A Define: 3
(i) Absorbance , (ii) Transmittance, (iii) Radiant power.
B Attempt any **three** of the following :-
i Explain standard addition method. 4
ii Explain steps involved in chemical analysis. 4
iii Define: (a) Beer's law, (b) Lambert's law and derive $A = \epsilon \cdot c \cdot l$ 4
iv Write a note on applications of analytical chemistry. 4
v Write a note on single beam photometer. 4

SECTION - II

- Q 4.** **A** State the phase rule. **3**
- B** Attempt any **three** of the following :-
- i** Write a note on Azeotropic mixture. **4**
 - ii** Write a note on positive and negative deviations. **4**
 - iii** State Nernst distribution law and mention its applications. **4**
 - iv** What are partially miscible liquids ? Explain the term " Upper critical solution temperature". **4**
 - v** What is steam distillation ?
Describe it with a neat diagram **4**
- Q5.** **A** What is Galvanic cell ? Give an example of the same. **3**
- B** Attempt any **three** of the following :-
- i** Give the comparison between primary and secondary cell. **4**
 - ii** Describe the relation for Henderson equation for PH of a basic buffer. **4**
 - iii** What is meant by reference electrode ?
and describe the Calomel electrode in detail. **4**
 - iv** Calculate the electrode potential of the following single electrode at 298 K.
Ag | AgCl | Cl⁻ (a = 0.01)
Given $E^{\circ} \text{Ag} | \text{AgCl} = 0.2224 \text{ V}$, $R = 8.314$, $F = 96500$ **4**
 - v** Derive the relation of Nernst equation for potential of a galvanic cell . **4**
- Q6.** **A** Define: **3**
- (i) Titrant, (ii) End point, (iii) Equivalence point.
- B** Attempt any **three** of the following :-
- i** Write a note on Oswald's theory of acid-base indicator theory. **4**
 - ii** Describe the technique of calibration of pipettes and burettes. **4**
 - iii** Explain photometric titrations. **4**
 - iv** Explain principles of potentiometric titrations. **4**
 - v** Give the advantages and disadvantages of conductometric titrations. **4**