

Bachelor of Science (B.Sc.) Semester—II

Examination

CHEMISTRY

Compulsory Paper—II

(Physical Chemistry) CH-202

Time—Three Hours]

[Maximum Marks—50

N.B. :— (1) All FIVE questions are compulsory and carry equal marks.

(2) Draw diagrams and give chemical equations wherever necessary.

1. (A) Derive the relationship between enthalpy of reaction at constant pressure and that of at constant volume.

One mole of naphthalene was burnt in oxygen gas at constant volume to give carbon dioxide and water at 25 °C. The heat evolved was found to be 5138.8 kJ. Calculate the enthalpy of reaction at constant pressure. ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)

5

MMW—11551

1

(Contd.)

(B) State Joule-Thomson effect. Describe Joule-Thomson experiment and show that enthalpy remains constant under adiabatic expansion of a real gas. 5

OR

1. (C) Explain :

(i) Intensive and

(ii) Extensive properties. 2½

(D) State and explain Hess's law of constant heat summation. 2½

(E) Define the following terms :

(i) Isothermal and Adiabatic processes

(ii) State function and Path function. 2½

(F) One mole of an ideal gas expands isothermally and reversibly from 1 dm^3 to 50 dm^3 at 27°C . Calculate the maximum work done.

($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$). 2½

2. (A) State Phase rule. Draw and discuss the salient features of phase diagram of water system. 5

-  (B) State and explain Nernst's Distribution law. Find out amount of solute extracted from 100 ml of an aqueous solution containing 9 g of it using 50 ml CHCl_3 at a time in two instalments. The distribution coefficient of solute between CHCl_3 and water is 5. 5

OR

2. (C) Explain :

(i) Phase and

(ii) Components. $2\frac{1}{2}$

- (D) Find out the number of components present in the following system :

(i) $\text{KCl} - \text{NaBr} - \text{H}_2\text{O}$ system

(ii) $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$. $2\frac{1}{2}$

- (E) Draw and discuss the vapour pressure composition diagram for an ideal solution. $2\frac{1}{2}$

- (F) Define upper-critical solution temperature. Discuss the system with upper critical solution temperature. $2\frac{1}{2}$



3. (A) Define transport number of an ion. How transport number of an ion is determined by moving boundary method. 5

(B) Write notes on :

(i) Relaxation effect and

(ii) Electrophoretic effect. 5

OR

3. (C) How does equivalent conductance varies with dilution ? 2½

(D) The resistance of 0.01 m solution of an electrolyte was found to be 210 ohm. Calculate the molar conductance of the solution at 25 °C. Cell constant of the conductivity cell is 0.88 cm^{-1} . 4 2½

(E) State and explain Kohlrausch law of ionic mobility 2½

(F) Discuss the conductometric titration of weak acid with strong base. 2½

4. (A) Derive integrated rate expression for the second order reaction in which the initial concentration



of the reactants is same.

The following results were obtained for the saponification of ethylacetate using equal concentrations of ester and alkali.

t(min.)	0	4.90	10.07
Volume of HCl used (ml)	47.60	38.90	32.60

Show that reaction is second order. 5

(B) Describe Lindemann's theory of unimolecular reactions. 5

OR

4 (C) Explain :

- (i) Pseudounimolecular reactions and
- (ii) Zero order reactions. 2½

(D) Define activation energy of a reaction. How it is determined by graphical method ? 2½

(E) The $t_{\frac{1}{2}}$ of a reaction is halved as the initial concentration of the reactant is doubled. Find the order of a reaction. 2½

MMW—11551

33 Chem - (10)
(F) Discuss Collision theory of bimolecular gaseous reactions. $2\frac{1}{2}$

5. Attempt any **ten** questions out of the following :

1×10

- (a) Give two statements of first law of thermodynamics.
- (b) Define :
 - (i) Open and
 - (ii) Isolated systems.
- (c) Define bond dissociation energy.
- (d) What is value of temperature and pressure at triple point in water system ?
- (e) State Raoult's law of relative lowering of vapour pressure.
- (f) What do you mean by Eutectic Point ?
- (g) Define specific conductance of a solution.
- (h) Why A.C. Source is used in the conductance measurement of electrolytic solution ?



(i) The speed ratio of silver to nitrate ions in solution of AgNO_3 subjected to electrolysis is 0.90. Find transport number of NO_3^- ion.

- (j) Define order of a reaction.
- (k) Write the integrated rate expression for the second order reactions in which initial concentrations of the two reactants are different.
- (l) What is the effect of concentration on rate of a reaction ?