NKT/KS/17/5083

Bachelor of Science (B.Sc.) Semester–II (C.B.S.) Examination

CHEMISTRY (Physical Chemistry) : CH-202

Compulsory Paper—2

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

The enthalpy of combustion of ethyl alcohol is 1380.7 kJ mol^{-1}. If the enthalpies of formation of CO_2 and H_2O are 394.5 and 286.6 kJ mol^{-1} respectively. Calculate the enthalpy of formation of ethyl alcohol. 5

(B) What is Joule-Thomson effect ? Show that in Joule-Thomson experiment the enthalpy of gas remains constant. What is Joule-Thomson coefficient ? 5

OR

(C) What are extensive and intensive properties ? Give two examples of each of them. 2½

(D) Define the following terms :

(i) Open, Closed and Isolated systems and 2½

(ii) Reversible and Irreversible processes. 2½

(E) One mole of an ideal gas expands isothermally and reversibly from 5 bar to 1 bar at 298 K. Calculate the maximum work done. ($R=8.314 JK^{-1} mol^{-1}$). 2½

(F) Explain :

(i) Average bond energy and

(ii) Bond dissociation energy. 2½

2. (A) Draw and discuss the phase diagram of sulphur system. 5

(B) State and explain Nernst's Distribution law.

In the distribution of benzoic acid between water and benzene, the following results were obtained.

C_1 (In Water)	1.50	1.95	2.97
C_2 (In Benzene)	24.20	41.2	97.0

What information do you gather regarding the molecular state of benzoic acid in benzene ? 5

OR

(C) Explain :

(i) Phase and

(ii) Components. 2½

(D) Discuss Pattinson's process of desilverisation of lead. 2½

(E) State and explain Raoult's law of ideal solutions. 2½

(F) Discuss system with an upper as well as a lower critical solution temperature. 2½

3. (A) Discuss Debye-Huckel theory of conductance of strong electrolytes with respect to :

(i) Asymmetric effect and

(ii) Electrophoretic effect. 5

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

OR

(C) How does equivalent conductance vary with dilution ? 2½

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

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

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

4. (A) What is order of reaction ? Derive the equation $K = \frac{1}{t} \cdot \frac{x}{a(a-x)}$ for second order reaction. What is the unit of K in the equation ? 5

(B) Discuss transition state theory. Derive an expression for the rate constant based on equilibrium constant. 5

OR

(C) Discuss the various factors influencing the rate of reaction. 2½

(D) Define half-life period. Describe half-life period method for the determination of order of reaction. 2½

(E) Calculate the activation energy for the decomposition of N_2O_5 whose rate constants at 300K and 340 K are 2.2×10^{-5} 5^{-1} and $5.5 \times 10^{-3}s^{-1}$ respectively. 2½

(F) Discuss the Lindemann's theory as applied to the unimolecular reaction. 2½

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

(i) Define state functions

(ii) Give two statements of first law of thermodynamics

(iii) Define heat capacity of a system.

(iv) Write the reduced phase rule equation.

(v) State Henry's law.

(vi) Why are azeotropic mixtures constant boiling mixtures ?

(vii) Why AC source is used in the conductance measurement of electrolytic solution ?

(viii) Give two advantages of conductometric titration ?

(ix) What do you understand by the degree of dissociation ?

(x) Define zero order reaction.

(xi) Give any two advantages of transition state theory over collision theory.

(xii) What is Pseudo unimolecular reaction ? 1×10=10