

Roll No.

(011/17-I)

5193

B. Sc. EXAMINATION

(Third Semester)

CHEMISTRY

CH-202

Physical Chemistry

Time : Three Hours

Maximum Marks : 26

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. Select at least *two* questions from Sections A and B.

1. (a) Define Thermodynamics ? What are its limitations ?
- (b) What is the significance of thermodynamics ?
- (c) What is Chemical Equilibrium ?
- (d) What is activity of a gas ?

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- (e) Mention two conditions for validity of distribution law.
- (f) Can we find the distribution coefficient of iodine between water and ethyl alcohol why or why not ? 1×6

Section A

2. (a) Write short note on Joule Thomson effect. 1
- (b) What is Joule Thomson coefficient ? Derive an expression for the coefficient for an ideal gas equation. 2
- (c) Define heat capacity. Derive expression for heat capacity at constant volume and that at constant pressure. 2
3. (a) Show that maximum work is produced in a reversible isothermal expansion of a gas. 1½
- (b) Calculate the bond energy of HCl. Given that bond energies of H_2 and Cl_2 are 430 kJmol^{-1} and 242 kJmol^{-1} respectively ΔH_f° for HCl is -91 kJmol^{-1} . 1½

- (c) Explain the comparison of isothermal and adiabatic expansion of an ideal gas with the help of pressure volume graph. 2
4. (a) Define the term :
- (i) system and surroundings
 - (ii) types of systems
 - (iii) state of the system and state variables.
- (b) Calculate W , q , ΔU and ΔH in adiabatic expansion of an ideal gas. 2

Section B

5. (a) Derive law of chemical equilibrium thermodynamically. 2
- (b) On the basis of Le-Chateliers principle. Discuss the effect of pressure on the boiling point of a liquid. $1\frac{1}{2}$
- (c) The value of equilibrium constant K_p for the reaction $N_2O_2 \rightleftharpoons 2NO_2$ at $25^\circ C$ is 0.14. Calculate standard free energy change ΔG° for the reaction. $1\frac{1}{2}$

6. (a) What is Nernst distribution law ? Explain and verify it experimentally. $2\frac{1}{2}$
- (b) 0.83 gm succinic acid was shaken up with 100 ml each of water and ether. The water layer was found to contain 0.70 gm. of succinic acid. The rest having passed on into the ether layer, calculate the quantity of succinic acid which can be extracted from 1000 ml of ether solution containing one gm of acid using 100 ml of water in one lot and in two equal fractions. $2\frac{1}{2}$
7. (a) On the basis of Clapeyron-Clausius equation discuss how ice-skating becomes possible. $1\frac{1}{2}$
- (b) What is Hydrolysis ? Also define degree of hydrolysis ? $1\frac{1}{2}$
- (c) Write the formula for finding the hydrolysis constant in case of hydrolysis of aniline hydrochloride. 1
- (d) Write three applications of Clausius Clapeyron. 1