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M.Sc. (Part - I) (Semester - I) (CBCS) Examination,
March - 2023

PHYSICAL CHEMISTRY - I
CC-103 : Chemistry/Applied Chemistry/Industrial
Chemistry (Paper - III)
Sub. Code : 87851

Day and Date : Friday, 23 - 06 - 2023
Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 80

- Instructions :
- 1) Question one is compulsory is compulsory.
 - 2) Solve any two questions from section I and Section II.
 - 3) All question carry equal marks.
 - 4) Figures to the right indicates marks.
 - 5) Use of log-tables-non programmable scientific calculator is allowed.
 - 6) Neat diagrams and sketches should be drawn wherever necessary.

Q1) Answer the following.

[16]

- a) Free energy of mixing (ΔG_{mixing}) is given by the equation _____.
- b) Define entropy.
- c) State Raoult's law.
- d) Define partial molar volume.
- e) Complete the equation $\int_{S_0}^{S_T} dS = C_p \int_0^T ?$
- f) Write Stirling's approximation form?
- g) Express internal energy, E, in terms of molar partition function.
- h) Identify the missing term $S = R (\ln [e^{5/2} V/Lh^3])?$
- i) Which parameter/s is/are estimated using adsorption isotherm analysis using BET equations?
- j) Adsorption of gases on solid is accompanied with _____.
- k) The entropy of the system increases in micellization. True or false.
- l) What are surface active agents?

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- m) Define degree of polymerization.
- n) Write an empirical relation between osmotic pressure of a polymer solution and its molecular weight.
- o) Mention any two initiators used in radical polymerization.
- p) The number of repeating unit in a polymer is called _____.

SECTION - I

- Q2) a) Derive any two Maxwell relations. [8]
b) Derive an expression for Gibb's - Duhem equation of partial molar properties. [8]
- Q3) a) Derive an expression for translational partition function for a monoatomic gas. [8]
b) Using the Boltzmann equation for entropy derive an expression for general partition function. [8]
- Q4) a) Why polymers have average molar mass? Derive an expression for number average molar mass of the polymer. [8]
b) What is condensation polymerization? Derive the rate expression for condensation polymerization. [8]

SECTION - II

- Q5) a) Describe the applications of colloids in catalysis. [6]
b) What is electrokinetic phenomenon? Explain the Tendam effects in colloids. [6]
c) Distinguish between the chemisorptions and physisorption process. [4]
- Q6) a) Describe with suitable example cationic polymerization. [6]
b) What is number average molar mass? Discuss any one method for number average molar mass estimation? [6]

- c) At 20°C the solubility of nitrogen gas in water is 0.0150 g/litre when the partial pressure of N_2 is 580 torr. Find the solubility of N_2 in H_2O at 20°C when its partial pressure is 800 torr. [4]

Q7) Write short notes on any three of the following. [16]

- Photophysical properties of colloids
- Average molar mass of polymers
- Stirling's approximation
- Critical Micelle concentration (CMC)

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