

B.Sc. Semester - 5 (CBCS) Examination

Oct/Nov. - 2022(Old Course)

PHYSICAL AND ANALYTICAL CHEMISTRY (CORE)

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

- Q.1(A) **Answer the following question.** (04)
Write a note on entropy change in spontaneous processes.
- Q.1(B) **Answer the following questions. (Any two)** (10)
- A. Derive the equation: $\Delta S_T = 2.303nR \log \frac{V_2}{V_1}$.
 - B. Discuss the physical significance of entropy in detail.
 - C. Calculate the change in entropy of mixing, when 0.30 mole Neon gas and 0.70 mole Xenon gas are mix at given temperature. ($R = 1.987 \text{ Cal} \cdot \text{K}^{-1} \cdot \text{mole}^{-1}$)
- Q.2(A) **Answer the following question.** (04)
Derive the Gibbs-Helmholtz equation.
- Q.2(B) **Answer the following questions. (Any two)** (10)
- A. Explain: Variation in work function with volume and temperature in detail.
 - B. Discuss the formation of two pair of partially miscible liquids in a ternary system.
 - C. One mole of an ideal gas is expanded isothermally reversibly at 300 K temperature to a volume of 202 Lit. and pressure is 10 atm to 2 atm. Calculate W and ΔG of the gas expansion. ($R = 1.987 \text{ Cal} \cdot \text{K}^{-1} \cdot \text{mole}^{-1}$)
- Q.3(A) **Answer the following question.** (04)
Define: Optical density and discuss the spectrophotometric estimation when lack of absorbance by product and reactant.
- Q.3(B) **Answer the following questions. (Any two)** (10)
- A. What is secondary reference electrode? Explain Calomel electrode in detail.
 - B. Explain in detail: Weston standard cell.
 - C. Explain: Reversible and Irreversible cell with suitable example.
- Q.4(A) **Answer the following question.** (04)
Discuss the Conductometric titration curve for strong acid with strong base.
- Q.4(B) **Answer the following questions. (Any two)** (10)
- A. Describe the method to determine the solubility and solubility product of sparingly soluble salt by conductometry.
 - B. Explain: Principle of Metal ion indicators and give structure, characteristics and applications of Murexide indicator.
 - C. Explain shape of precipitation titration curve of BaCl_2 by Na_2SO_4 by conductometry.
- Q.5(A) **Answer the following question.** (04)
What is back titration? Derive the P^{H} range for Phenolphthalein indicator.
- Q.5(B) **Answer the following questions. (Any two)** (10)
- A. Write a note on Volhard's method for estimation of halides.
 - B. Discuss: Iodimetry titration with any one example.
 - C. Define: External redox indicator and write a note on $\text{K}_3[\text{Fe}(\text{CN})_6]$ indicator.
