Roll No. ⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜   **Total No. of Pages : 02**

Total No. of Questions : 19

PIT M.Sc (Chemistry)   (Sem.-1)
PHYSICAL CHEMISTRY-I (THERMODYNAMICS AND ELECTROCHEMISTRY)
Subject Code : CHL-403
Paper ID : [51142]

Time : 3 Hrs.   **Max. Marks : 70**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains SIX questions carrying FIVE marks each and students have to attempt ALL questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. What is meant by chemical potential?

2. Partial molar volume can be positive or negative-Explain.

3. Define activity coefficient of an electrolyte with suitable mathematical expression.

4. How the ionic strength is related with activity coefficient?

5. Give the number of phases, components and degree of freedom for the following:

   Ice, water and vapour in equilibrium

6. What is an invariant system? Give an example.

7. What is meant by term eutectic? State the condition in which two substances can form a simple eutectic.

8. Write down Ilkovic equation with meaning of different parameters.

9. What is an azeotrope mixture? Give example.

10. What is meant by half wave potential in polarography?

SECTION-B

11. Derive Gibbs-Duhem equation.

12. Derive an expression for the entropy of a mixture of ideal gases.

13. Calculate the total ionic strength of solutions that contains 0.30 M $CaCl_2$, 0.30 M Na_3PO_4, 0.10 M of Na_2SO_4 and 0.2 M NaCl.

14. Sketch well labelled phase diagram of water system.

15. Write a short note on primary salt effect.

16. Show that in the case of a mixture of ideal gases, the chemical potential of any constituent is given by the expression:

$\mu_i = \mu_i(p)^0 + RT \ln p_i$, where the symbols have their usual meaning.

SECTION-C

17. Draw and discuss the phase diagram for a three component system consisting of two solids A and B and water.

18. Show that for an ideal solution containing two components A and B, the Gibbs free energy of mixing is minimum when the mole fractions of the two components are the same, *i.e.*, equal to half each.

19. Describe the Lindemann theory of unimolecular reactions. Write a short note on flash photolysis for studying kinetics of fast reactions.