Exam. Code : 103203
Subject Code : 1344

B.A./B.Sc. 3rd Semester

CHEMISTRY

(Physical Chemistry—II)

Time Allowed—3 Hours] [Maximum Marks—35

Note :— Part-A : **ALL** questions are compulsory. Each question carries **1** mark.

Part-B : Attempt ***six*** questions in all, selecting ***two*** questions from each section. Each question carries **4½** marks. Log tables may be aksed for.

PART—A

1. Differentiate between state and path functions.
2. Define Joule-Thomson coefficient and give its significance.
3. State second law of thermodynamics in different ways.
4. Explain the concept of residual entropy.
5. Define upper and lower consulate temperatures.
6. What do you mean by triple point ? Mention its importance.
7. Define various terms involved in the phase rule.
8. Write down the relationship between K_p, K_a and K_c.

$8 \times 1 = 8$

PART—B

SECTION—I

9. (a) Show that for an ideal gas $C_p - C_v = R$.

   (b) Derive an expression for the work done in the reversible isothermal expansion of an ideal gas. 2.5,2

10. Explain the difference between the following :

   (a) Isothermal and adiabatic processes.

   (b) Extensive and intensive properties.

   (c) Dependent and independent variables. 3×1.5

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

   (b) Derive Kirchhoff's equation.

   (c) Explain why the enthalpy of neutralization of strong acid with strong base is nearly the same in all the cases ? 1.5,2,1

SECTION—II

12. (a) Derive an expression for entropy change of mixing of ideal gases.

   (b) A reversible heat engine working between 0 and 100°C absorbs 750 J of heat from the source. Calculate :

   (i) the work done

   (ii) the heat given to the sink

   (iii) the efficiency of the engine. 1.5,3

13. (a) How will you evaluate absolute entropy of solids from heat capacity data using third law of thermodynamics ?

(b) Deduce the following relationships :

(i) $dA = -PdV - SdT$

(ii) $dG = TdS + VdP$. 2.5,2

14. Write notes on the following :

(a) Clausius inequality

(b) Spontaneity

(c) Nernst heat theorem. 3×1.5

SECTION—III

15. (a) Establish a relationship between equilibrium constant and free energy.

(b) Give thermodynamic derivation of Gibb's phase rule. 2.5,2

16. Sketch and explain the phase diagrams of the following systems :

(a) Mg – Zn

(b) NaCl – H_2O. 2,2.5

17. Write notes on the following :

(a) Steam distillation

(b) Azeotropes

(c) Nernst distribution law. 3×1.5