CHEMISTRY PAPER–XI

(Physical Chemistry–A)

Time Allowed : 3 Hours

Max. Marks : 22

Note : Attempt five questions in all, one question from each Unit and the compulsory question (No. 9). Compulsory question carries 6 marks and remaining all questions carry 4 marks each.

UNIT–I

1. Discuss the difference between liquid crystals, solids and liquids. Also discuss the seven segment cell as used in the display in an LCD screen.

2. Discuss briefly the nature of intermolecular forces using suitable diagrams.   4,4

UNIT–II

3. For a liquid-vapour equilibrium :

Liquid $\rightleftharpoons$ Vapour

Derive the integrated form of Clausius-Clapeyron equation starting from the Clapeyron equation.

4. Derive the expression for the Vant Hoff reaction isotherm for a general reversible reaction.

UNIT–III

5. Derive an expression for the entropy change of an ideal gas with change in temperature and pressure.

6. Derive an expression for the efficiency of a Carnot cycle.

UNIT–IV

7. How is absolute entropy evaluated from heat capacity data ? Show graphically and discuss how the Debye T-cubed law is used to evaluate the absolute entropy of solids in the vicinity of OK.

8. Discuss the Nernst heat theorem and derive the statement of third law of thermodynamics from it.

UNIT–V

(Compulsory question)

9. (a) Write the mathematical expression for the Lennard-Jones intermolecular potential. Draw its curve and discuss briefly.

(b) What per cent T_1 is of T_2 for a Carnot engine having efficiency 20%?

(c) Calculate ΔS when an ideal gas (1 mol) expands isothermally to twice its initial volume reversibly. Given $R = 8.314 \ JK^{-1} \ mol^{-1}$; $\log 2 = 0.3010$.

(d) Define residual entropy of a crystal. Illustrate it using a suitable example.

$4 \times 1\frac{1}{2} = 6$

BOTANY Paper–A