

2012

B.A./B.Sc. (General) Third Semester

Chemistry

Paper – XI: Physical Chemistry – A

(Same for B. Sc. Microbial and Food Technology)

Time allowed: 3 Hours

Max. Marks: 22

NOTE: Attempt five questions in all, including Question No. IX (Unit-V) which is compulsory and selecting one question each from Unit- I – IV.

x-x-x

Unit - I

- I. (a) Explain the types of intermolecular forces of attraction occurring in HF and N₂. 2
 (b) How do different types of liquid crystals differ in their molecular arrangement? 2
 II. (a) What are cholestric liquid crystals? What are the uses of liquid crystals? 2
 (b) Define Transition point and melting point? 2

Unit - II

- III. (a) The value of equilibrium constant K_p for a reaction 2

$$\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2$$
 At 25^o C is 0.19. Calculate standard free energy change ΔG^0 for reaction.
 (b) Derive Van't Hoff equation $\frac{d \ln K_p}{dT} = \frac{\Delta H}{RT^2}$ 2
 IV. (a) Applying Le-Chatelier's principle, predict the effect of pressure and temperature 2
 on the melting of ice.
 (b) Derive Clapeyron equation, $\frac{dP}{dT} = \frac{\Delta H}{T\Delta V}$, all symbols have their usual meaning. 2

Unit - III

- V. (a) Explain the physical significance of Entropy. 2
 (b) Prove that in an irreversible process 2

$$\Delta S_{\text{(system)}} + \Delta S_{\text{(surroundings)}} > 0$$

 VI. (a) Derive $\Delta S_{\text{(mix)}} = -R \sum x_i \ln x_i$. (i = 1 to N) 2
 (b) Define entropy of vaporization. Calculate the enthalpy of vaporization per mole of 2
 ethanol, given that entropy of vaporization of ethanol is 109.8 JK⁻¹ mol⁻¹ and boiling
 point of ethanol is 78.5^o C.

Unit - IV

- VII. (a) Derive the following expression: 2

$$\left(\frac{\partial G}{\partial T}\right)_P = -S \quad \text{and} \quad \left(\frac{\partial G}{\partial P}\right)_T = V$$

 (b) Give two applications of Gibbs Helmholtz equation. 2
 VIII. (a) Explain variation of Helmholtz function with temperature and volume. 2
 (b) What do you understand by criterion of spontaneity? Explain it in terms of ΔG . 2

(2)

UNIT - V

IX. Attempt the following:-

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| (a) What is the effect of temperature on ΔS mixing of ideal gases? | 1 |
| (b) What is thermography? | 1 |
| (c) State second law of thermodynamics. | 1 |
| (d) What is clausius inequality? | 1 |
| (e) What do you mean by thermodynamic scale of temperature? | 1 |
| (f) What is the usefulness of equilibrium constant? | 1 |

X-X-X