(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 9 Sub. Code : 0 2 5 2

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B.A./B.Sc. (General) 3rd Semester

1128

CHEMISTRY

Paper : (XI : Physical Chemistry-A)

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

Time Allowed : Three Hours] **[Maximum Marks : 22**

Note :– (1) Attempt **Five** questions in all, selecting at least **one** question from each Section. Sections A to D carry equal marks. Section E is compulsory.

(2) Use of log tables and simple calculator is allowed.

SECTION—A

1. (a) What are 'van der Waals Forces' ? How do they originate in polar and non polar molecules ? Explain with the help of suitable examples.

(b) What do you understand by the term 'Liquid Crystals' ? Describe the application of liquid crystals in electronic industry. 2,2

2. (a) State and explain 'Le Chatlier's principle'. With the help of this principle explain the effect of temperature and pressure on the solubility of gases in liquids.

(b) Write a short note on 'Thermography'. 2,2

SECTION—B

3. (a) Derive 'Clausius Clapeyron Equation' for Liquid $\rightleftharpoons$ Vapour equilibrium. Also give its integrated form.

   (b) For what type of reactions :—

   $K_P = K_C$? 3,1

4. (a) Derive 'Van't Hoff Reaction Isotherm'.

   (b) The 'Equilibrium Constant' K_P for the reaction $A \rightleftharpoons B$ at 600 K and 650 K are 1×10^{-12} and 5×10^{-11} respectively. Calculate ΔH for this reaction. Given that $R = 8.314\ JK^{-1}\ mol^{-1}$. 2,2

SECTION—C

5. (a) Describe 'Carnot Cycle'. Derive an expression for the efficiency of a reversible heat engine working between temperatures T_1 and T_2 ($T_2 > T_1$).

   (b) What do you understand by 'Clausius Inequality' ? 2,2

6. (a) Derive an expression for the 'Entropy Change' of an ideal gas, when the temperature changes from T_1 to T_2 and volume changes from V_1 to V_2.

   (b) Calculate the entropy change for the fusion of 1 mole of a solid which melts at 400 K. The enthalpy change of fusion i.e. ΔH_f is 3.6 KJ mol^{-1}. 2,2

SECTION—D

7. Derive 'Gibb's Helmholtz Equation' as $\left[\frac{\partial(\Delta G/T)}{\partial T}\right]_P = \frac{-\Delta H}{T^2}$.

   Also give two applications of this equation. 4

8. (a) What is 'Nernst Heat Theorem' ? What result follows from it regarding entropy change and heat capacity change of a system ? How it leads to the definition of 'Third Law of Thermodynamics' ?

(b) Calculate the 'Free Energy Change', which occurs when one mole of an ideal gas expands isothermally and reversibly at 300 K from an initial volume of 5 litres to 100 litres. ($R = 8.314\ JK^{-1}\ mol^{-1}$). 2,2

SECTION—E

9. (a) What type of 'Liquid Crystals' are used in 'Medical Field' ?

(b) The value of 'Free Energy' of a system at equilibrium is at its maximum value or minimum value ? Comment.

(c) What is the effect of temperature on ΔS_{mixing} of two ideal gases ?

(d) Which out of silica glass or quartz has higher entropy ?

(e) What is the 'Criterion of Spontaneity and Equilibrium' in terms of dS ?

(f) What is the physical significance of 'Free Energy of a system ? $6 \times 1 = 6$