

B.Sc. II (With Credits)-Regular-Semester 2012 Sem III
B.Sc. 2352 - Chemistry-II (Physical Chemistry)

P. Pages : 2

Time : Three Hours



GUG/W/16/3333

Max. Marks : 50

- Notes : 1. All **five** questions are compulsory and carry equal marks.
2. Draw diagrams and give equations wherever necessary.

1. a) Derive an Expression for efficiency of carnot cycle working between the temperatures T_1 & T_2 . **5**
- b) Explain Hess's law of constant heat of summation. Calculate the heat of reaction, **5**
 $C_2H_4(g) + H_2(g) \longrightarrow C_2H_6(g)$ at $25^\circ C$ if the heat of combustion of ethylene, hydrogen and ethane are -337.0 , -68.4 and 373.0 Kcal respectively at $25^\circ C$.

OR

- c) Explain Intensive and Extensive properties with example. **2½**
- d) Define various types of systems with suitable examples. **2½**
- e) Explain Joule-Thomson porous plug experiment with suitable diagram. **2½**
- f) Derive Kirchoff's equation showing effect of temperature on heat of reaction. **2½**
2. a) Explain drawbacks of first law of thermodynamics state the statements of second law of thermodynamics. **5**
- b) What are partial molar properties? What is chemical potential? Derive an expression for Vont Hoff's reaction isochore. **5**

OR

- c) Derive Gibb's – Helmholtz equation. **2½**
- d) Explain the entropy as criteria of spontaneity and equilibrium. **2½**
- e) The values of K_p at 1.51 and 0.52 at $100^\circ C$ and $140^\circ C$ respectively. Calculate ΔH of the reaction. ($R = 8.314 \text{ Jk}^{-1}\text{mol}^{-1}$). **2½**
- f) Discuss Helmholtz free energy with its significance. **2½**
3. a) State phase rule. Explain the terms involved in it. Apply phase rule to lead-silver system. **5**
- b) Discuss phenol water system. Explain the effect of impurity on a two liquid component system. **5**

OR

- c) Discuss : i) Triple point. ii) Eutectic point. **2½**
- d) Explain Raoult's law for ideal solutions. **2½**

- e) State Nernst's distribution law. What are its limitations? 2½
- f) If 16 gm of an organic acid is present in 100 ml of its aqueous solution. How much of it would be left unextracted after two successive applications of 50 ml of acetone. The distribution coefficient of the solute between water and acetone is 2 in favour of acetone. 2½
4. a) State and explain various laws of crystallography. 5
- b) Derive Bragg's equation. At what angles will x-rays of wave length 1.542×10^{-10} m undergoes first order and second order reflections by planes separated by 3.5×10^{-10} m. 5

OR

- c) Discuss powder method for the study of crystal structure. 2½
- d) Discuss in brief Weiss indices and Miller indices. 2½
- e) What are the crystallographic dimensions of their unit cells if some solids belong to the following crystal systems? 2½
- i) Triclinic. ii) Tetragonal.
- f) Both NaCl and KCl have similar structure, yet their x-ray diffraction patterns are remarkably different. Why? 2½

5. Attempt **any ten**.

- a) What is state function? 1
- b) State the statement of first law of thermodynamics. 1
- c) Define inversion temperature. 1
- d) Define standard free energy. 1
- e) Define entropy. 1
- f) Write equation for relation between standard free energy change and equilibrium constant. 1
- g) Draw phase diagram for sulphur system. 1
- h) State Henry's law. 1
- i) Define lower and upper consolute temperature. 1
- j) Define space lattice. 1
- k) Identify the crystal system $a \neq b \neq c, \alpha = \beta = \gamma = 90^\circ$. 1
- l) A crystal plane has intercepts on the three axes of crystal as $\frac{1}{3}, \frac{3}{4}, \frac{1}{2}$. 1
What are Miller indices of the face.
