

B.Sc. (Part-I) (C.B.C.S. Pattern) Sem-II
USCChT04 - Chemistry Paper-II : Physical Chemistry

P. Pages : 2

Time : Three Hours



GUG/S/19/11575

Max. Marks : 50

- Notes : 1. All questions are compulsory and carry equal marks.
2. Draw diagram wherever necessary.

1. a) Solve the equation, 5
 $3^{2x+7} = 7^{3x+2} \times 2^{x+1}$
Given, $\log 2 = 0.3010$
 $\log 7 = 0.8451$
 $\log 3 = 0.4771$
- b) What is buffer solution? Explain the mechanism of acidic buffer action with suitable example. 5
Find the hydrolysis constant of a salt which is 0.018% hydrolyzed in a 0.12 M solution.
OR
- c) The collision frequency of a gas is $3.222 \times 10^{32} \text{ cm}^{-3} \text{ hour}^{-1}$. Convert it into SI unit. 2½
- d) Evaluate $\int \frac{x^4 + 2x^3 - 4x^2 - 2x + 7}{x} dx$ 2½
- e) State and explain Ostwald's dilution law of weak electrolytes. 2½
- f) What is hydrolysis of salt? Why are the salts of strong acids and strong bases not hydrolyzed. 2½
2. a) Explain Carnot cycle and derive expression for efficiency of Carnot heat engine operating between the temperature T_1 and T_2 . 5
- b) State and explain Hess's law of constant heat summation. With example. 5
One mole of naphthalene ($C_{10}H_8$) was burnt in oxygen gas at 25°C . The heat evolved at constant volume was 5138.8kJ. Calculate enthalpy of reaction.
($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$).
OR
- c) What is Joule - Thomson co-efficient? Show that $\mu_{JT} = 0$ for an ideal gas. 2½
- d) Define; i) Heat capacity and ii) Isolated system 2½
State the difference between state function and path function.
- e) A quantity of air at 300k is compressed adiabatically to one third of its volume. Find the change in its temperature. 2½
- f) Derive Kirchoff's equation. 2½
3. a) What are the postulates of kinetic theory of gases. Deduce Avogadro's Law and Graham's Law of diffusion from kinetic gas equation. 5
- b) Define compressibility factor. How does it vary with pressure in case of real gas? 5
At what temperature will molecules of hydrogen have the same RMS velocity as oxygen molecule at 0°C .

OR

- c) What is meant by mean free path? Explain its variation with pressure and temperature. 2½
- d) State and explain Maxwell's distribution law of molecular velocities. 2½
- e) Derive reduced equation of a state. State the law of corresponding states. 2½
- f) The critical constants for water are $T_C = 647 \text{ K}$; $P_C = 218 \text{ atm}$; $V_C = 0.057 \text{ lit mol}^{-1}$. Calculate Van Der Waals constant. 2½
- 4.** a) State and explain Law of constancy of interfacial angles. Describe powder method to study the crystal structure. 5
- b) Define viscosity. Explain Ostwald viscometer method for the determination of viscosity of liquids. 5
- In the stalagmometer method, the number of drops of ethanol and water are 714 and 300 at 25°C respectively. Calculate the surface tension of ethanol if that of water is $72.75 \times 10^{-3} \text{ Nm}^{-1}$ Given: Density of water = $0.9981 \times 10^3 \text{ Kgm}^{-3}$ and Density of ethanol = $0.7894 \times 10^3 \text{ kgm}^{-3}$.
- OR**
- c) Derive Bragg's equation for X-ray diffraction by crystal. 2½
- d) What are Weiss and Miller indices? A face makes intercept 2a and 3b on the X-axes and Y-axes respectively and does not cut the Z-axes at all. What are the Miller Indices. 2½
- e) State the law of symmetry? Explain different types of elements of symmetry present in crystals. 2½
- f) Define the terms: 2½
- i) Parachor ii) Intrinsic viscosity.
- Explain the effect of temperature on viscosity of liquids.
- 5.** Solve **any ten**. 10
- i) Find the slope and Y-intercept of line having equation $2y-3x+2=0$.
- ii) Calculate pH of $2 \times 10^{-2} \text{ M HCl}$ solution.
- iii) Define common ion effect.
- iv) State first law of thermodynamics in two different ways.
- v) Write thermochemical equation for the formation of ammonia if enthalpy of formation is $-46.1 \text{ kJ mol}^{-1}$
- vi) Define the term thermodynamic process.
- vii) Write Van Der Waals equation for "n" mole.
- viii) Define collision number and collision diameter.
- ix) What is excluded volume in real gas.
- x) What are Bravais Lattices.
- xi) Draw Crystal structure of NaCl.
- xii) Define surface tension? Write its CGS unit.
