NKT/KS/17/5046

Bachelor of Science (B.Sc.) Semester—I (C.B.S.) Examination

CHEMISTRY

(Physical Chemistry)

Compulsory Paper—2

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) All **FIVE** questions are compulsory and carry equal marks.

(2) Write chemical equations and draw diagrams wherever necessary.

1. (A) State and deduce the following from kinetic gas equation :

(i) Avogadro's law and

(ii) Graham's law of diffusion. 5

(B) Define :

(i) Critical volume

(ii) Critical temperature and

(iii) Critical Pressure.

The critical temperature and critical pressure of chlorine are 419 K and 93.1 atmosphere respectively. Calculate the van der-Waal's constants for chlorine gas. 5

OR

(C) Discuss Maxwell-Boltzmann's distribution of molecular velocities. 2½

(D) Calculate the temperature at which RMS velocity of oxygen molecule will be equal to Hydrogen molecule at 20 K. 2½

(E) Give the explanation of deviation of real gases by means of van der Waal's equation of state. 2½

(F) Explain compressibility factor and Boyle temperature. 2½

2. (A) Derive Bragg's equation for diffraction of X-rays. The first order diffraction from a certain crystal is observed at an angle of 20.6° with X-rays of wavelength 22.91 nm. Calculate the interplanar spacing. 5

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(B) State and explain :

(i) Law of constancy of interfacial angles and

(ii) Law of rationality of indices. 5

OR

(C) What are Miller indices ? The Weiss indices of a certain plane are $\frac{1}{2}, \frac{1}{3}$ and ∞. Find Miller indices. 2½

(D) Draw (100), (110) and (111) planes of simple cubic crystal. 2½

(E) Discuss Laue's method for determination of crystal structure. 2½

(F) Why Bragg's method show that KCl is simple cubic though it is face centred cubic like NaCl ? 2½

3. (A) What are intermolecular forces ? Discuss the following intermolecular forces in liquids :

(i) Dipole—induced dipole interactions and

(ii) London forces. 5

(B) How surface tension of a liquid is determined by capillary rise method ? At what height will a liquid rise in a capillary tube having 0.1 mm diameter ?

(Density of liquid = 1.3×10^3 kgm^{-3}

Surface tension of liquid = 6.5×10^{-3} Nm^{-1}

Acceleration due to gravity = 9.8 ms^{-1}). 5

OR

(C) What are liquid crystals ? Discuss cholesteric liquid crystals. 2½

(D) How relative viscosity of a liquid is determined by Ostwald's viscometer ? 2½

(E) The molar refraction of acetic acid is 13.3×10^{-6} m^3 mol^{-1} and its density is 1.046×10^3 kgm^{-3}. Calculate refractive index of acetic acid. 2½

(F) What is parachor ? Discuss application of parachor in structure determination. 2½

4. (A) Give the assumptions and derive an expression for Langmuir adsorption isotherm. 5

(B) Write BET equation. How is it used in the determination of surface area of the absorbent ? 5

OR

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(C) What are the important applications of adsorption ? 2½

(D) Explain with examples homogeneous and heterogeneous catalysis. 2½

(E) Explain auto catalysis with examples. 2½

(F) Write a note on enzyme catalysis. 2½

5. Attempt any **ten** questions of the following :

(i) State any two postulates of Kinetic theory of gases.

(ii) Define mean free path.

(iii) Write van der Waal's equation of state for n moles of real gas.

(iv) Define space lattice.

(v) Identify the crystal structure with the dimensions of unit cell :

$a = b = c$ and $\alpha = \beta = \gamma \neq 90°$

(vi) Draw unit cell of CsCl.

(vii) Why the liquid drop is spherical ?

(viii) What is intrinsic viscosity ?

(ix) Define refractive index.

(x) What are inhibitors ?

(xi) Define the term chemical adsorption.

(xii) Write Michaelis-Menten equation. 1×10=10

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