**KNT/KW/16/5046**

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

**CH-102 : 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) Draw diagrams wherever necessary.

1. (A) State any five postulates of Kinetic Theory of Gases. From Kinetic gas equation deduce Grahm's law of diffusion. 5

(B) Derive van der Waal's equation of state. Write it for *n* moles. 5

**OR**

(C) Calculate average velocity and most probable velocity of nitrogen molecule at NTP. Given that root mean square velocity of nitrogen molecule is 493.14 $ms^{-1}$. 2½

(D) Define the terms :

(i) Mean free path and

(ii) Collision Frequency. 2½

(E) What is an ideal gas ? Discuss the deviation of real gases from ideal behaviour. 2½

(F) Describe Andrew's experiment for critical phenomenon. 2½

2. (A) Explain :

(i) Law of constancy of interfacial angles and

(ii) Law of rationality of indices. 5

(B) Derive Bragg's equation for diffraction of X-rays. At what angles will X-rays of wavelength $1.542\times10^{-10}$ m undergo first order and second order reflections by planes separated by $3.5\times10^{-10}$m ? 5

**OR**

(C) What do you mean by crystal lattice ? Sketch simple cubic crystal showing (110) and (111) planes. 2½

(D) What are Miller indices ? Calculate the Miller indices of crystal plane having intercepts 2a, b and 3c where a, b and c are unit cell dimensions. 2½

(E) Sketch three types of Bravais lattice of cubic system. 2½

(F) Describe Powder Method for determination of crystal structure. 2½

3. (A) What are intermolecular forces ? Discuss the following intermolecular forces in liquids :
   (i) Dipole-Dipole Interaction and
   (ii) Ion-Dipole Interaction. 5

   (B) Explain coefficient of viscosity. How is viscosity of unknown liquid determined by Ostwald's viscometer? 5

**OR**

   (C) Explain : Structural differences between solid. liquid and liquid crystal. 2½

   (D) Write a note on seven segment cell. 2½

   (E) The number of drops of water and ethanol counted at 298 K are 300 and 714 respectively. Calculate the surface tension of ethanol if the density of ethynyl is $0.7895\times10^{3}$ $kgm^{-3}$ and that of water is $0.9980\times10^{3}$ $kgm^{-3}$ (surface tension of water = $72.0\times10^{-3}$ $Nm^{-1}$ at 298 K). 2½

   (F) Explain refractive index of a medium. How is it determined by Abbe's refractometer ? 2½

4. (A) What is adsorption ? Write the differences between physical adsorption and chemical adsorption. What are the factors affecting adsorption of gases by solids ? 5

   (B) Derive Michaelis-Menten equation. 5

**OR**

   (C) Explain Freundlich adsorption isotherm. How can it be verified ? 2½

   (D) Describe any five applications of adsorption. 2½

   (E) Write BET equation. Explain the terms involved in it. 2½

   (F) Explain with example homogeneous and heterogeneous catalysis. 2½

5. Attempt any **TEN** questions of the following :
   (i) Define most probable velocity.
   (ii) State Avogadro's law.
   (iii) What is compressibility factor ?
   (iv) What is crystallography ?
   (v) Draw unit cell diagram of CsCl crystal.
   (vi) Define crystal lattice.
   (vii) Give any two applications of liquid crystal.
   (viii) Define parachor value.
   (ix) Define the term molar refractivity.
   (x) Why is a gas adsorbed on the surface of a solid ?
   (xi) Define enzyme catalysis.
   (xii) Explain autocatalysis. 1×10=10