



TKN/KS/16/5761

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

**Compulsory Paper—II
CH-102 : Physical Chemistry**

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) Derive kinetic gas equation, $PV = \frac{1}{3} m n u^2$ for an ideal gas. 5

(B) Describe critical phenomenon in the light of Andrew's experiment on isotherm of CO_2 gas. Calculate critical temperature and critical volume if the Vander Waal's constants for carbon dioxide gas are $a = 3.6 \text{ atm dm}^6 \text{ mol}^{-2}$, $b = 4.28 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1}$ and $R = 0.0821 \text{ atm dm}^3 \text{ K}^{-1} \text{ mol}^{-1}$. 5

OR

(C) Discuss graphically Maxwell-Boltzman distribution of molecular velocities. $2\frac{1}{2}$

(D) Define :

(i) Mean free path

(ii) Collision diameter and

(iii) Collision number. $2\frac{1}{2}$

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(Contd.)



(E) Explain the deviation of real gases on the basis of Vander Waal's equation. $2\frac{1}{2}$

(F) For a gas obeying Vander Waal's equation, prove that $P_c V_c = \frac{3}{8} RT_c$. $2\frac{1}{2}$

2. (A) Define :

- (i) Plane of symmetry
- (ii) Axis of symmetry
- (iii) Centre of symmetry.

Prove that a cube has 23 elements of symmetry. 5

(B) What is a unit cell ? Draw a neat diagram of unit cell of NaCl and CsCl crystals. A crystal plane intercepts the three axes of a crystal at the multiplies of $\frac{3}{2}$, 2 and 1 of the axial lengths.

What are the Miller indices of this plane ? 5

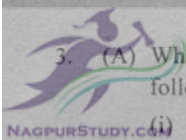
OR

(C) What does the symbol d_{hkl} stands for ? Determine the interplanar spacing between plane of a (212) cubic lattice of length $6.0 \text{ \AA}$. $2\frac{1}{2}$

(D) Why is Bragg's method unable to show that KCl has F.C.C. crystal structure like NaCl ? $2\frac{1}{2}$

(E) Sketch three types of Bravais lattices of cubic system. $2\frac{1}{2}$

(F) Describe Laue's method for determination of crystal structure. $2\frac{1}{2}$



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

(i) Dipole-dipole interaction and

(ii) Dipole-induced dipole interaction. 5

(B) Define the term surface tension. Describe how surface tension of a liquid is determined by drop-number method. The number of drops of water and ethanol counted at 298 K are 400 and 952 respectively. Calculate the surface tension of ethanol given that density of ethanol is $0.7895 \times 10^3 \text{ kgm}^{-3}$ and that of water is $0.9980 \times 10^3 \text{ kgm}^{-3}$. (Surface tension of water is $72.0 \times 10^{-3} \text{ Nm}^{-1}$ at 298 K). 5

OR

(C) Write a note on Nematic liquid crystals. $2\frac{1}{2}$

(D) Write a note on seven segment cell. $2\frac{1}{2}$

(E) Describe Ostwald's viscometer method to determine coefficient of viscosity of a liquid. $2\frac{1}{2}$

(F) Define refractive index. The refractive index of liquid benzene at 298 K is 1.5000 and its density is $0.87 \times 10^3 \text{ kg m}^{-3}$. Find the molar refraction of liquid benzene at 298 K. $2\frac{1}{2}$

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

(B) Explain with examples homogeneous and heterogeneous catalysis. What is a catalytic promotor ? Explain with suitable examples. 5

OR

- (C) Explain Freundlich adsorption isotherm. How can it be verified ? 2½
- (D) How BET equation can be used in the determination of surface area of the adsorbent ? 2½
- (E) What are the important applications of adsorption ? 2½
- (F) Explain enzyme catalysed reactions. 2½
5. Attempt any **ten** questions of the following :
- Define Boyle temperature.
 - Define compressibility factor.
 - What is meant by an ideal gas ?
 - State law of constancy of interfacial angles.
 - Name any two types of crystal systems.
 - Identify the crystal structure with the dimensions of unit cell :
 $\alpha \neq \beta \neq \gamma \neq 90^\circ$ and $a \neq b \neq c$.
 - Define parachor value.
 - Define intrinsic viscosity.
 - Give any two applications of liquid crystal.
 - What are inhibitors ?
 - Define autocatalysis.
 - Write Michaelis-Menten equation. 1×10