

Roll No.

(01/22-II)

5169

B. Sc. EXAMINATION

(First Semester)

CHEMISTRY

Paper-II (CH-102)

Physical Chemistry

Time : Three Hours

Maximum Marks : 26

Note : Attempt *Five* questions in all, selecting *two* questions from each Section. Q. No. 1 is compulsory.

1. (a) What is the significance of van der Waals constant ' a ' and ' b ' ?
- (b) State Law of constancy of interfacial angles.
- (c) Define Boyle Temperature.
- (d) What is Parachor ?

- (e) What is Optical exaltation ?
- (f) State the mathematical form of Maxwell's distribution of velocities. $1 \times 6 = 6$

Section A

2. (a) Calculate the Collision frequency and mean free path of oxygen molecules at 0°C and one atm. pressure, given that the molecular diameter of oxygen molecule is 2×10^{-8} cm, $R = 8.314 \times 10^7$ ergs $\text{K}^{-1} \text{mol}^{-1}$. 3
- (b) Derive the relationship for Boyle Temperature from van der Waals equation.

$$\text{i.e. } T_B = \frac{a}{Rb}. \quad 2$$

3. (a) Explain the Behaviour of Real gases by van der Waals equation. 3
- (b) Given that the van der Waals constants for 1 gram molecule of CO_2 are $a = 3.609 \times 10^6$ and $b = 42.75$ (volume in

mL and pressure in atmospheres).
Calculate the values of the critical constants. 2

4. (a) Derive van der Waals equation :

$$\left(P + \frac{an^2}{v^2} \right) (v - nb) = nRT. \quad 3$$

(b) Explain Linde's Process for liquefaction of Gas. 2

Section B

5. (a) Briefly explain the application of liquid crystal in LCD and Thermography. 3

(b) Determine the crystal structure of KCl. 2

6. (a) Define surface tension. Describe one method for determining surface tension of a liquid. 3

(b) A crystal plane has intercepts on the three

axes of the crystal as $\frac{1}{3}a$; $\frac{3}{4}b$ and $\frac{1}{2}c$.

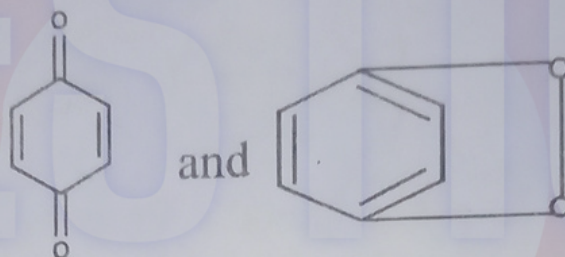
What are the Miller indices of the face ? 2

7. (a) Derive Bragg's equation ($n\lambda = 2d \sin\theta$).

3

(b) For Quinone $C_6H_4O_2$, the following two constitutions have been proposed :

2



The experimental value of parachor for quinone is 237 (Parachor value for H = 17.1, C = 4.8 for double bond = 23.2, O = 20.0 and a ring of six carbon = 6.1). What constitution would you accept ?