

**2024****(Session : 2022-26)***Time : 3 hours**Full Marks : 75*

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Answer from both the Groups as directed.*

**Group – A**  
**(Compulsory)**

1. Answer all questions of the following :  $1 \times 10 = 10$
- (a) What is the temperature at which the volume of all gases becomes zero ?
  - (b) Write the mathematical expression for r. m. s. velocity.
  - (c) Show that average kinetic energy for one gram mole of an ideal gas is  $\frac{3}{2} RT$ .

- (d) Write van der Waal's equation of state for  $n$  moles of the gas.
- (e) Define surface tension.
- (f) What is Bragg's equation ?
- (g) What do you mean by plane of symmetry ?
- (h) How the co-ordination number in the crystal lattice is related with pressure and temperature ?
- (i) What do you mean by strong electrolytes ?
- (j) Give an example of diprotic acid.
2. Explain Bronsted and Lowry concept of acids and bases. 5

### Group - B

Answer any four questions of the following :

3. (a) What are the important postulates of kinetic theory of gases ? 6
- (b) Derive an expression for pressure on the basis of kinetic theory of gases. 9
4. (a) Deduce van der Waal's equation of state. What are the units of van der Waal's constants 'a' and 'b' ? 9+2 = 11

KW - 40/2

(2)

Contd.

- (b) 3 moles of  $\text{SO}_2$  occupy a volume of  $10\text{dm}^3$  at 15 atm pressure. Calculate the temperature.

Given :  $a = 6.7 \text{ atm dm}^6 \text{ mol}^{-2}$ .

$$b = 0.0564 \text{ dm}^3$$

$$R = 0.082 \text{ dm}^3 \text{ atm K}^{-1} \text{ mol}^{-1} \quad 4$$

5. Explain the terms 'viscosity' and coefficient of viscosity of a liquid. How does viscosity of a liquid vary with temperature ? Describe the principle and apparatus used for the measurement of coefficient of viscosity of a liquid. 2+2+2+9 = 15
6. What are the elements of symmetry in crystallography ? Describe each of them briefly. Define the law of symmetry and give a suitable example to support your answer. 8+7 = 15
7. (a) What do you mean by buffer solution ? How an acidic and basic buffer solution is prepared ? Discuss the mechanism of buffer solution. 2+2+5 = 9
- (b) Derive an expression for pH of a buffer solution. 6

KW - 40/2

(3)

(Turn over)

8. Write short notes on any **three** of the following :

5+5+5 = 15

- (a) Chemical Equilibrium
- (b) Le-chatelier's principle
- (c) Common ion effect
- (d) Ionic product of water

