Reg. No :..............................

Name :...............................

BACHELOR'S DEGREE (C.B.C.S.) EXAMINATION, FEBRUARY 2024
2021 ADMISSIONS SUPPLEMENTARY (SAY)
SEMESTER V - CORE COURSE (CHEMISTRY)
CH5B07B18 - Physical Chemistry - I

Maximum Marks : 60

Time : 3 Hours

Part A

I. Answer any Ten questions. Each question carries 1 mark

(10x1=10)

1. Calculate the temperature at which RMS velocity of chlorine gas be equal to sulphur dioxide at STP.

2. Calculate RMS velocity of hydrogen gas at 200^0C.

3. Define collision diameter.

4. Identify the dependence of collision frequency with a) pressure b) temperature.

5. Choose the correct statement. A) Anisotropic materials are crystalline B) Isotropic materials are crystalline C) Anisotropic materials have short range order D) Anisotropic materials are supercooled liquids

6. Choose an example for a p type semiconductor. A) P in Si host B) Ge doped with As C) Al in Si host D) Ge doped with Sb.

7. Recall the order of atomic distances in a crystal.

8. A cation is missing from a lattice site and the adjacent cation acquires a higher oxidation state. Identify the defect shown by the crystal lattice.

9. The physical properties of solids show different values when measured in different directions in the same crystal. Identify the reason.

10. Lyophilic colloids are called reversible colloids. Recall.

11. Sky appears blue. Identify the reason.

12. Bead of water formed on leaf. Recall.

Part B

II. Answer any Six questions. Each question carries 5 marks

(6x5=30)

13. A) Arrive at the ratio of most probable velocity, RMS velocity and average velocity of a gas at certain temperature. B) Calculate the RMS and average velocity of ethane at 310K.

14. A) Discuss the dependance of coefficient of viscosity of a gas on i) Temperature ii) Pressure iii) Mean free path.
    B) The RMS velocity of Hydrogen gas at STP is 1.83×10^5 cm/sec and its mean free path is 1.78×10^{-5} cm. Calculate the collision number at STP.

15. Discuss the Fluorite structure.

16. A diffraction experiment using X-ray wavelength 0.134 nm gave first order diffractions when θ was 10.5°. Calculate the distance between the planes in the crystal.

17. Define voids in a crystal. Distinguish between tetrahedral and octahedral voids.

18. Discuss the postulates of BET isotherm?

19. Write a note on i) electrodialysis ii) Ultra filtration

20. Explain (A) protective colloids (B) Protective action of hydrophilic colloids on a hydrophobic colloid.

21. Discuss the factors affecting surface tension of a liquid. Outline the measurement of surface tension using drop weight method.

Part C

III. Answer any Two questions. Each question carries 10 marks

(2x10=20)

22. A) The collision diameter of Oxygen gas is 3.61×10^{-10} m. if the temperature is 298 K, calculate (i) mean free path at 1 atmp (ii) mean free path at 10^{-3} mm of Hg (iii) collision number at 1 atmp (iv) collision frequency at 1 atmp. [1 atmp = $101325 \times N/m^2$]

    B) Distinguish n-type and p-type semiconductors.

23. Starting from van der Waal's equation for 1 mole of a gas, obtain its virial form and derive Boyle's temperature.

24. A) Differentiate between zinc blend and wurtzite structures.

    B) Define critical temperature and critical pressure. Pc and Tc of carbon dioxide gas are $73.82 \times 10^5 N/m^2$, and 304.2 K respectively. Calculate van der Walls constants a and b.

25. A) Derive the $d_{200} : d_{110} : d_{222}$ for a BCC lattice.

    B) Sketch the (200), (110), (222) planes of a BCC lattice.