CSM : 22

CHEMISTRY
PAPER - I

Time Allowed : 3 hours   Full Marks : 100

Marks for each question is indicated against it.
Attempt <u>any 5 (five)</u> questions taking not more than 3 (three) questions from each Part.

PART - A

1. (a) Derive Bragg's equation of X-ray diffraction. An X-ray of wavelength 54.6Å falls on a crystal of interplanar distance of 2.73Å. Calculate the angle for the first order reflection. **(7)**

    (b) Draw and discuss the phase diagram for carbon dioxide system. In what respects does this system differ from the water system? **(7)**

    (c) What is radius ratio rule? How does coordination number vary with the radius ratio? **(6)**

2. (a) Explain the deviation of real gases from ideal behaviour and derive the Van der Waals equation of state. **(7)**

    (b) Show that the Joule Thomsom coefficient for an ideal gas is zero. **(6)**

    (c) Derive the expression for the entropy change accompanying variation of temperature and volume. **(7)**

3. (a) Deduce Langmuir adsorption isotherm equation. **(7)**

    (b) Discuss the electrical properties of colloids. Explain why precipitation of a colloidal sol is not easy in presence of gelatine. **(6)**

    (c) Describe the moving boundary method for the determination of transport number. What are the factors that influence the transport number of ions? **(7)**

4. (a) Derive an integrated rate expression for a second order reaction. **(7)**

    (b) Explain the effect of temperature on the rate constant. **(6)**

    (c) Discuss the kinetics of photochemical reaction between hydrogen and chlorine. Explain why the quantum efficiency for this reaction is very high whereas the quantum yield for the photochemical reaction between hydrogen and bromine is very low. **(7)**

PART - B

5. (a) What do you understand by Heisenberg's Uncertainty principle and explain with the help of the concept of probability? A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1Å. What is the uncertainty involved in the measurement of its velocity? (mass of the electron=9.1×10^{-31} Kg and Planck's constant-6.626×10^{-34} Js) **(7)**

 (b) Define ionization energy. Discuss the variation of ionization energy along the second period and also explain the anomaly. **(6)**

 (c) What is binding energy per nucleon? What is the significance of this value? Draw the diagram to illustrate how the binding energy per nucleon varies with the mass number. Comment on the shape of the curve. **(7)**

6. (a) Draw the molecular orbital energy level diagram of CO molecule and explain its polarity and ligating behavious towards metal ions. **(7)**

 (b) What do you understand by hybridization? Account for the geometry of PH_3 and ClF_3 on the basis of hybridization and VSEPR theory. **(6)**

 (c) What are metalloporphyrins? Discuss the role of myoglobin and haemoglobin in oxygen transport? **(7)**

7. (a) What is inert pair effect? Explain why Pb^{2+} compounds are more stable than Pb^{4+} compounds. **(5)**

 (b) $K_2[MnCl_4]$ has a magnetic moment of 5.9 BM. Comment on the hybridization and shape of the complex. **(5)**

 (c) Discuss the main points of difference in the properties of the elements of the first transition series with those of the elements of the second and third transition series. **(5)**

 (d) Li has a greater tendency to form covalent compound than any other elements in the group. Explain. **(5)**

8. (a) What do you understand by Lanthanide contraction? How does it effect the chemistry of d block elements? **(7)**

 (b) Discuss the oxidation properties of potassium permanganate in acidic, alkaline and neutral medium. **(6)**

 (c) Describe the osmotic pressure measurements for the determination of molar masses of polymers. **(7)**

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