

Bachelor of Science (B.Sc.) Semester—VI (C.B.S.) Examination

CH-601 : INORGANIC CHEMISTRY

Paper—1
(Chemistry)

Time : Three Hours]

[Maximum Marks : 50

N.B. :— (1) All **FIVE** questions are compulsory and carry equal marks.

(2) Write equations and draw diagrams wherever necessary.

1. (A) Explain crystal field splitting in tetrahedral complexes. Give reasons for smaller value of crystal field splitting in tetrahedral than in octahedral complexes. 5
- (B) Explain the following with example :
- (i) Spin selection rule and
- (ii) Laporte selection rule. 5

OR

- (C) Explain how the nature of central metal ion affects the magnitude of crystal field splitting. 2½
- (D) What is CFSE ? Calculate CFSE for the following ions in octahedral complexes :
- (i) d^4 strong field and
- (ii) d^6 weak field. 2½
- (E) Explain electronic absorption spectra of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion with respect to :
- (i) Position of absorption band and
- (ii) Intensity of absorption band. 2½
- (F) What is meant by hole formalism principle ? Explain with example. 2½
2. (A) (i) Discuss spin and orbital contribution to the magnetic moment.
- (ii) Explain in which of the following cases there is orbital contribution to magnetic moment :
- (a) d^4 high spin octahedral complex and
- (b) d^5 low spin octahedral complex. 5
- (B) Explain what are stepwise stability and overall stability constants. Derive relationship between them. 5

OR

- (C) What are high spin and low spin complexes ? Explain with example. 2½
- (D) Explain on basis of CFT, $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic in nature. 2½
- (E) What is thermodynamic stability of complexes ? Which complex of the following two is more stable and why :
- (i) $[\text{Fe}(\text{CN})_6]^{3-}$ or
- (ii) $[\text{Fe}(\text{CN})_6]^{4-}$? 2½
- (F) Explain the terms labile complexes and inert complexes. 2½
3. (A) (i) Derive the equation $A = \epsilon \cdot c \cdot t$.
- (ii) Explain the conditions for deviation from Beer-Lambert's Law. 5
- (B) Describe the principle and technique used in ascending paper chromatography. Give any two applications of it. 5

OR

- (C) The molar absorptivity of a compound in an aqueous solution at 765 nm is 1.54×10^3 . The % T of a solution of this compound in a cell with 1 cm path length is 43.2. Calculate concentration of the solution. 2½
- (D) Draw schematic diagram of double beam colorimeter. 2½
- (E) What is ion exchange capacity ? How is it determined for an acidic resin ? 2½
- (F) Discuss the different factors which influence solvent extraction. 2½
4. (A) What are silicones ? Give one method of preparation of :
- (i) Linear silicones and
- (ii) Crosslinked silicones. 5
- (B) What are phosphonitrilic halides ? Give one method of preparation of :
- (i) Triphosphonitrilic chloride and
- (ii) Tetraphosphonitrilic chloride. 5

OR

- (C) What are silicone oils ? Give any three uses of silicone oils. 2½
- (D) What happens when $(\text{NPCl}_2)_3$ is :
- (i) Heated at 150-300°C and
- (ii) Hydrolysed ? 2½
- (E) Write notes on Silicon resins. 2½
- (F) Discuss the structure and bonding in $(\text{NPCl}_2)_3$ molecule. 2½

5. Attempt any **TEN** of the following :

- (i) Draw crystal field splitting diagram of d-orbitals in octahedral field.
- (ii) Calculate CFSE for d^6 system in tetrahedral field.
- (iii) Explain why electronic spectra of $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ complex ion shows a broadband.
- (iv) Calculate spin only magnetic moment of d^5 low spin octahedral complex.
- (v) Write the formula for total magnetic moment ($\mu_s + \mu_L$).
- (vi) What is chelate effect ?
- (vii) Define Molar extinction coefficient.
- (viii) Give any two differences between colorimeter and spectrophotometer.
- (ix) Define :
 - (i) R_f value and
 - (ii) Elution.
- (x) Write reaction for the action of benzene on $(\text{NPCl}_2)_3$ in presence of AlCl_3 .
- (xi) What are silicon resins ?
- (xii) Draw the boat form structure of $(\text{NPCl}_2)_3$.

1×10=10