

B.Sc. 5th Semester (Honours) Examination, 2022 (CBCS)**Subject : Chemistry****Course : CC-XI****Time: 2 Hours****Full Marks: 40***The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer *any five* questions: 2×5=10
- Define hypoligated and hyperligated complex.
 - What is the significance of the term Dq ?
 - ' $d - d$ '-transitions are forbidden—Comment.
 - Define magnetic double exchange phenomenon.
 - What is nephelauxetic effect?
 - Write the equation by using which we can determine the magnetic moment of the lanthanides.
 - Write some differences between $4f$ and $5f$ orbitals.
 - Write the cause of actinide contraction.
2. Answer *any two* questions: 5×2=10
- Give an example of low-spin Tetrahedral-complex and draw its ' d '-orbital splitting diagram with electronic configuration and calculate its CFSE value. 3
 - Which type of distortion is preferred by Cu(II)-complexes? Give reason. 2
 - What is OSSE? Explain with example. 3
 - Define magnetic super exchange phenomenon. 2
 - Explain the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O}_6)]^{3+}$. 3
 - Define pairing energy and give the factors on which pairing energy depends. 2
 - Draw the Orgel diagram of d^2 and d^4 for Oh & Td complexes respectively. 3
 - Draw the structure of Ni-DMG complex and calculate its CFSE value. 2
3. Answer *any two* questions: 10×2=20
- You have passed a solution containing La^{3+} , Gd^{3+} and Lu^{3+} through an ion-exchange column. Then you elute the column with ammonium citrate solution. Explain in which order the ions will be eluted out. Calculate the effective magnetic moment (μ_{eff}) of Pr^{3+} -ion (3+2)
 - The lanthanide elements show the common stable oxidation state of +3. Explain. 2
 - Mention the conditions for orbital contribution in spin only magnetic moment. 3

- (b) (i) Determine the magnetic moment for the ground state of Ho^{3+} ion and Gd^{3+} ion. 3
(ii) Draw the MO diagram of LMCT. 2
(iii) One complex of Fe^{+2} is coloured due to $d - d$ transition, but another Fe^{+2} complex is very pale coloured. Explain with appropriate illustration. 3
(iv) Why heavier congener elements easily produce low-spin complexes? 2
- (c) (i) Define ferromagnetism and anti-ferromagnetism correlating with the spin exchange coupling constant (J). 3
(ii) What do you mean by Curie Point and Neel Point? 2
(iii) Write the relationship between spectra and magnetic moment of a complex. 2
(iv) Comment on the magnetic behaviour of solid AgO . 3
- (d) (i) What is intensity stealing? Give an example. 3
(ii) ' MnO_4^- is intensely coloured but TcO_4^- and ReO_4^- are colourless'— account for the fact. 2
(iii) Absorption band of $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ gives transition band at 12300 cm^{-1} , 18500 cm^{-1} and 27900 cm^{-1} . Identify the transition for 12300 cm^{-1} . 2
(iv) Aqueous $\text{Mn}(\text{II})$ -Sulphate is almost colourless but aqueous solution of $\text{Cu}(\text{II})$ -sulphate is blue — Explain. 3
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