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

Question Paper Code: 53962

Ph.D. COURSE WORK EXAMINATION, DECEMBER 2015

Elective

Technology

15PCY101 - CHEMICAL BONDING, REACTION MECHANISM AND BIOINORGANIC CHEMISTRY

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

(5 x 20 = 100 Marks)

1. (a) (i) What do you understand by overlap of Atomic Orbitals? Explain the overlap criterion in explaining bond strength. (10)

(ii) Write the electronic configuration of *NO* molecule

(1) What is the Bond order?

(2) Will the bond length be shorter or larger than in NO^+?

(3) How many unpaired electrons will be present in *NO* Molecule? (10)

Or

(b) (i) Draw the shapes of following molecules according to the VSEPR theory:

(1) H_2O (2) NH_3 molecules. (14)

(ii) Using VSEPR theory, explain decrease in bond angle from NH_3 to H_2O. (6)

2. (a) (i) How does Valence Bond theory explain the shapes and magnetic properties of four coordinated complexes of Ni^{2+}? Illustrate your answer. (10)

(ii) State and explain Jahn–Teller distortion effect. (10)

Or

(b) (i) How do you account for the following fact:
$[Ni(CN)_4]^{2-}$ is diamagnetic while $[NiCl_4]^{2-}$ is paramagnetic. (10)

(ii) Calculate the CFSE for each of the following systems
(1) d^4 (high spin octahedral) and (2) d_6 (low spin octahedral). (10)

3. (a) (i) Describe the mechanism involved in the base hydrolysis of $[Co(en)_2NH_3Cl]^{2+}$ in detail. (10)

(ii) Discuss the theories of *trans* effect, which theory explains better the *trans* effect of CO molecule compared to that of Pyridine? (10)

Or

(b) Discuss the types of intermediates that are formed in S_N1, S_N2 and S_N1 (CB) mechanisms with suitable examples. (20)

4. (a) (i) Discuss briefly the role of metal ions in biological systems. (12)

(ii) Write short notes on: Zinc Finger protein. (8)

Or

(b) (i) Explain briefly how the metal complexes interact with DNA. (10)

(ii) Briefly explains:
(1) Gene regulating protein and (2) Chemotherapeutic agents. (10)

5. (a) (i) Explain briefly the iron storage and transport proteins in detail. (10)

(ii) Write short notes on Superoxide dismutase. (10)

Or

(b) (i) Discuss briefly the role and functions of heme and non-heme enzymes. (10)

(ii) Briefly explains:
(1) Cytochrome P450 and (2) Bleomycin. (10)

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