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Ex/FC/2/XVII/76/2017

FINAL B. SC. EXAMINATION, 2017

(2nd Semester)

CHEMISTRY (HONOURS)

PAPER - XVII

INORGANIC CHEMISTRY

- e) Propose a synthetic method for $\text{Mn}(\text{CO})_4(\text{PPh}_3)(\text{COMe})$ from $[\text{Mn}_2(\text{CO})_{10}]$.
- f) How would you assign the oxidation state on Co centers in $[\text{Co}(\text{CO})_4][\text{CO}(\text{CNR})_4]$ prepared from the reaction : $[\text{Co}_2(\text{CO})_8] + 5\text{CNR} \rightarrow [\text{Co}(\text{CO})_4][\text{CO}(\text{CNR})_4]$.

2×4

(*General Proficiency = 2*)

Time : Two hours

Full Marks : 50

1. a) Write a brief account on *any two* of the following :
 - i) Coordination chemistry of Li^+ .
 - ii) Cryptands and their utilities.
 - iii) Structural aspects of SnCl_2 in gas phase, solid state and as dehydrate.
- b) Describe *any two* of the following :
 - i) Structure of calcium oxalate dihydrate.
 - ii) Two core structures of chlorophyll.
 - iii) The method for the synthesis of tris (diethyldithiocarbamate) arsenic (III) and its structure. $(2\frac{1}{2}+2\frac{1}{2})+(1\frac{1}{2}+1\frac{1}{2})$
2. a) Describe a general method for the preparation of a dialkyl dihydroxy silane.
- b) What is a Siloxane ? Mention one utility of the starting material required to prepare siloxanes in the general preparation of silicones ?

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OR

Discuss the preparation of high thermal silicones.

- c) Compare and contrast the properties of benzene and borazine with regard to bonding, physical and chemical properties.
- d) How is B, B, B trimethyl boroxine prepared ?
- e) What happens when $[\text{NPCl}_2]_n$ reacts with catechol in the presence of Et_3N .

OR

How is phospham prepared ?

- f) Discuss the structure and bonding of phosphonitrilic halides. $1\frac{1}{2}+1+2+1+1+1\frac{1}{2}$
3. a) Discuss the Dewar-Chatt and metalacyclopropane models in the bonding of metal-alkene complexes.

OR

Give a brief account on the structure and bonding in metal allyl complexes.

- b) Give examples of η^6 , η^7 and η^8 ligands. Give an example of triple-decker cyclopentadienyl complex.
- c) Define oxidative addition and reductive elimination reactions. Give examples of 1, 1- and 1, 2- migratory insertion reactions. $3+2+(2+1)$

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4. a) How do the essential, toxic and beneficial metal ions respond in the biological system ?
- b) Explain the rule of efficiency which governs the uptake of metal ions by biological system. $4+4$
5. a) In comparison to 3d metal ions (in their 3+ states), 4f metal ions form weaker coordination compounds (in their 3+ states). Discuss the possible reasons for this observation.
- b) Lanthanoids in the 3+ states can effectively be separated using cation exchange resin. Discuss with all the possible equilibria involved in this separation. $3+5$
6. Answer **any four** of the following :
- a) Propose a structure for $[\text{Fe}_4(\eta^5\text{-C}_5\text{H}_5)_4(\text{CO})_4]$.
Given : highly intense coloured complex, $^1\text{H-NMR}$ gives only one signal and $\nu_{\text{CO}} = 1640 \text{ cm}^{-1}$.
- b) Show schematically the different bonding modes of nitrosyl ligand (NO) by both covalent and ionic model.
- c) "Cyanide can stabilize both higher and lower oxidation states" – Explain with examples.
- d) Predict the M–M bond order for neutral complexes with formula $[(\text{CO})_4\text{M}(\mu_2\text{-PR}_2)\text{M}(\text{CO})_4]$ when $\text{M} = \text{V}, \text{Cr}$ and Mn .

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