

FINAL B. SC. EXAMINATION, 2018

(2nd Semester, Special Supplementary)

CHEMISTRY (HONOURS)

PAPER - XVII

INORGANIC CHEMISTRY

Time : Two hours

Full Marks : 50

Answer the following questions :

4×2

1. Write a brief account on *any two* of the following :
 - i) Crown-ether complexes
 - ii) Grignard reagent
 - iii) Carbonic anhydrase enzyme
 - iv) Core structure of Chlorophyll
 - v) Coordination chemistry of Li^+

2. a) Describe the role of alkyl trihydroxy silanes, dialkyl dihydroxy silanes and trialkyl monohydroxy silanes in silicone formation. $1 \frac{1}{2}$

- b) While preparing silicone oils, a cyclic silicone with 3 or 4 silicon atoms is usually chosen as starting material and treated with conc. H_2SO_4 . What is the justification for this approach. Name another material used mentioning its role in the process. $1 \frac{1}{2} + 1 \frac{1}{2}$

[Turn over

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- c) How would you prepare N, N, N trimethyl borazine from readily available starting materials ? Show the reaction(s) involved. $1\frac{1}{2}$
- d) In brief explain how ^{31}P NMR was used to arrive at the structures of phosphonitrilic halide polymers. 2
3. a) Discuss the *Dewar-Chatt* and *metallocyclopropane* models in the bonding of metal-alkene complexes. 3
- b) Give examples of η^6 , η^7 and η^8 ligands. Give an example of triple-decker cyclopentadienyl complex. 2
- c) Define oxidative addition and reductive elimination reactions. Give examples of 1, 1-and 1,2-migratory insertion reactions. 2+2
4. a) Write down the differences in oxygen binding modes in haemoglobin and haemocyanin. 2
- b) Write down the role of distal and proximal histidine in haemoglobin. 1+1
- c) Comment on the toxicity of "As" and "Pb". 2
- d) Explain the coordination geometry and magnetic behaviour of oxy-Hb and deoxy-Hb. 1+1
5. a) State electronic configuration of Sm and Eu. 2
- b) How partial molal volumes of aquated lanthanoids vary with the $4f^n$ configurations ? Discuss. 3

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- c) Lanthanoids in their 3+ states can be separated by cation exchange. Discuss. 4
6. Answer any **four** of the following : 2x4
- a) Propose a structure of $[\text{Fe}_4(\eta^5\text{-C}_5\text{H}_5)_4(\text{CO})_4]$.
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 mode 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 M = V, Cr and Mn.
- e) Propose a synthesis for $\text{Mn}(\text{CO})_4(\text{PPh}_3)(\text{COMe})$ from $[\text{Mn}_2(\text{CO})_{10}]$.
- f) Explain the observation : 10Dq follows the order

