

## Department of Sciences, Manipal University II SEMESTER M.Sc END SEMESTER EXAMINATIONS, JUNE-JULY, 2016 SUBJECT: Inorganic chemistry-II [CHM-602] Date: 27/06/2016

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL questions.
- ✤ Write diagrams, equations or examples wherever necessary
- **1.A.** Describe three mechanisms responsible for the transport of dissolved species to and from an electrode surface? Explain three basic steps involved in the mechanism of solvent extraction process
  - **B.** Write the solvent extraction procedure for the determination of iron and copper. How do you choose a solvent for particular extraction?

(6+4)

**2.A.** i) List two advantages and two limitations of SCF extraction using Sc-CO<sub>2</sub>. Iron forms a chelate that will extract into nitrobenzene with a D of 3. What percentage of the metal will be extracted from a 25 mL sample if 10 mL of organic solvent is used?

ii) Describe principles and applications of the following chromatographic techniques.a) Ion exchange chromatography b) Size exclusion chromatography c) Paper chromatography

**B.** i) Describe different steps involved in column chromatographic process. Explain four factors that affect the column efficiency of LC.

**ii**) Explain the equipment used for HPLC. Write a technical note on the applications of GC in quantitative analysis

(6+4)

**3. A**. **i**) How do you distinguish typical inorganic complexes from organometallic complexes? Explain any three principal uses of inorganic complexes.

**ii**) Describe the three limitations of CFT. Write MOELD for an octahedral complex with metal-ligand pi bonding involving ligands having pi-acceptor capability.

- **B.** Give reasons for the following observations;
  - **a**)  $[Cu(CN)_2]^-$  is colorless while  $[Cu(NH_3)_4]^{2+}$  has blue color
  - **b)**  $[Cr(CN)_6]^{4-}$  is a strong field complex whereas  $[Cr(H_2O)_6]^{2+}$  is a weak field complex **c)** Low spin  $[Fe(CN)_6]^{4-}$  has zero magnetic moment and low spin  $[Ru(NH_3)_6]^{3+}$  has the magnetic moment of 1.73 BM
  - **d**) *Cis*-[PtCl<sub>2</sub>(en)] is chiral while cis-[RhCl<sub>2</sub>(NH<sub>3</sub>)<sub>4</sub>]<sup>+</sup> is achiral. (6+4)
- **4. A**. **i**) Explain the structure of hemoglobin and myoglobin. What are the differences in their functions in biological system?
  - ii) Write an explanatory note on a) Vitamin B-12 b) Chlorophyll
  - **B**. **i**) Explain the importance of porphyrin ring structure in oxygenation process with an example.
    - ii) Give reasons for the following;
    - a) High concentration of carbon monoxide is fatal to human beings.
    - **b**) Glass is transparent.

(6+4)

**5. A .i**) Describe the different types of thermotropic liquid crystals based on structure with examples.

**ii**) Explain the working of fuel cell with an example. What are the advantages and disadvantages of fuel cells?

- **B**. i) Write an explanatory note on any two types of smart materials.
  - ii) Distinguish between each of the following;
  - a) PVD and CVD
  - **b**) Glass and quartz

(6+4)

- 6. A. i) What are superconductors? Explain the types of refractories with examples. What are the roles of gypsum and iron oxides in cement?
  ii) Explain optical anisotropy in a liquid crystal? Describe the different classification schemes of composites according to the matrix and the reinforcement materials.
  - B. i) Explain the lock and key and induce fit model of enzyme catalysis.ii) Discuss the toxicity of lead, mercury and cadmium in biological system. Explain the use of chelating agents to treat heavy metal poisoning.

(6+4)

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