MANIPAL UNIVERSITY

Reg No										

DEPARTMENT OF SCIENCES

II SEMESTER M.Sc (CHEMISTRY) END SEMESTER EXAMINATIONS, April / May 2017

SUBJECT: INORGANIC CHEMISTRY II [CHM 602]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 19.04.2017 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Draw diagrams and write equations wherever necessary.

1. A. i) Describe the instrumentation involved in the thermogravimetric technique. Discuss two samples-related factors that affect the results.

ii) a) Three 30 mL ether extractions are required to remove 0.10g of fat from 1.0 g of meat dispersed in 30 mL of water. If the distribution ratio is 2, compare the result of one 90 mL extraction and three 30 mL extractions.

b) Sketch and explain the variation of magnetic susceptibility with temperature for three common types of magnetic materials.

B. Give reasons for the following observations:

a) $[Cu(MeCN)_4]^+$ is colorless, whereas $[Cu(NH_3)_4]^{2+}$ is blue.

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 a zero magnetic moment and low spin $[Ru(NH_3)_6]^{3+}$ has the magnetic moment of 1.73 BM

d) $[Co(NH_2CH_2CH_2NH_2)_3]^{3+}$ is chiral, whereas $CoCl_2(OH_2)_2$ is not chiral **(6+4)**

2. A. i) Explain the Soxhlet extraction technique for extraction of solids.

ii) For each of the two octahedral complex ions $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$, draw the orbital splitting diagram, predict the number of unpaired electrons and identify the ion as low spin or high spin.

B. i) Outline the procedure of the electrogravimetric method during the deposition of copper. How do you test for completeness of electrolysis?

ii) Discuss the classification of chromatographic methods based on the nature of separation mechanism. **(6+4)**

3. A. i) Explain four principal reasons why transition metals contribute to the effectiveness of catalysis. Explain two factors that affect the structure in transition metal complexes.

ii) Describe four applications of TGA technique

B. i) Draw geometrical isomers of each of the following complex ions; **a)** $[Co(C_2O_4)_2(H_2O)_2]^-$ **b)** $[Cr(en)(NH_3)_2I_2]^+$ **c)** $[Ir(NH_3)_3Cl_3]$ **d)** $[Pt(NH_3)_4I_2]^{2+}$

ii) Define each of the following and give examples; **a)** structural isomers **b)** linkage isomers **c)** optical isomers **d)** coordination isomers **(6+4)**

4. A. i) Explain the structural features and functions of iron storage and transport proteins.

ii) What are metallothionines? Give their function. Discuss the toxicity of lead, mercury, arsenic and cadmium in biological system.

B. i) Draw the d-orbital splitting diagrams for the octahedral complex ions of each of the following; **a)** Fe^{3+} (high spin) **b)** Fe^{2+} (high & low spin) **c)** Ni^{2+} **d)** Zn^{2+}

ii) Explain the working principles of ECD used in GC. **(6+4)**

5. A. i) What is cytochrome C oxidase? How is it different from cytochrome C? Explain the structural features of cytochromes.

ii) Distinguish the following;

a) Rubredoxin and ferredoxin **b)** prosthetic group and coenzyme **c)** Coring ring and porphyrin ring.

B. i) What is photosynthesis? Explain the process of photosynthesis by PS-I and PS-II reaction centers.

ii) Differentiate between exopeptidase and endopeptidase. Explain the structural features and functions of carboxypeptidase. **(6+4)**

6. A. i) What are thermotropic liquid crystals? Describe the features of nematic, smectic and columnar phase mesogens.

ii) How are fuel cells different from conventional galvanic cells? Explain the construction and working of H_2 - O_2 fuel cell.

B. i) What are ceramics? Explain the manufacture of portland cement with relevant reactions at different temperatures.

ii) What are the factors affecting the properties of composites? Explain the features of different types of particle reinforced composites. **(6+4)**

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