RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

M.A./M.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2016

FIRST YEAR [BATCH 2016-18]

Date : 14/12/2015 **APPLIED CHEMISTRY**

Time : 11 am – 1 pm **Paper :** I Full Marks : 50

(Use Separate Answer Script for <u>each Unit</u>)

Unit-I

(Answer <u>any one</u> question) [1×13]

1. a) State the difference, with example, between inner orbital and outer orbital complexes of a transition metal ion. [3]
   b) State the factors that affect the difference in energy between t_{2g} and e_g sets of orbitals in an octahedral complex. [3]
   c) Write down the d-orbital splitting pattern of Pt^{2+} ($5d^8$) in $PtCl_4^{2-}$. [3]
   d) Explain the metal ligand bonding in the co-ordination complex, $[Co(NH_3)_6]Cl_3$, in the light of qualitative pictorial M.O. approach. [4]

2. a) What is meant by 'Crystal Field Stabilization Energy' (CFSE) of a transition metal complex? Give expressions for CFSE of Fe^{2+} ion in weak and strong field octahedral crystal fields. [2+2]
   b) The spectra of CrF_6^{3-} solution shows three absorption bands at wave numbers 14900, 22700 and 34400 Cm^{-1}. Assign the bands and hence estimate the values of Dq_0 and the Racah parameter (B). [3+2]
   c) Predict the Spinel structure of Fe_3O_4. [2]
   d) Electronic transitions of d–d type displayed in spectra of octahedral transition metal complexes should be forbidden by the Laporte selection rule. Why are moderately strong spectra actually observed? [2]

Unit-II

(Answer <u>any one</u> question) [1×12]

3. a) What are the major interactions responsible for supramolecular aggregation? [2]
   b) Give a brief note on supramolecular Host-Guest chemistry with proper examples. [3]
   c) What are the important characteristics of explosives? [2]
   d) Write a note on cryogenic fuels. [2]
   e) Write a note on applications of nanoparticles. [3]

4. a) What is RDX? How it is prepared? [3]
   b) Why ammonium nitrate is an important ingredient for explosive formulation? [2]
   c) What do you mean by over oxidised and under oxidised explosives? [2]
   d) Write a short note on Molecular Switch. [2]
   e) Mention two measurement techniques for characterisation of nanomaterials. [1]
   f) Write notes on Carbon nanotubes. [2]

Unit-III

(Answer <u>any one</u> question) [1×13]

5. a) Give a brief introduction on (i) itai-itai disease. (ii) parkinson's disease [2+2]
   b) Explain the principle of chelation Therapy with reference to detoxification of Lead, Arsenic and Copper. [4]
   c) Give the active site structure of chlorophyll and explain the PS-I & PS-II. [2+3]

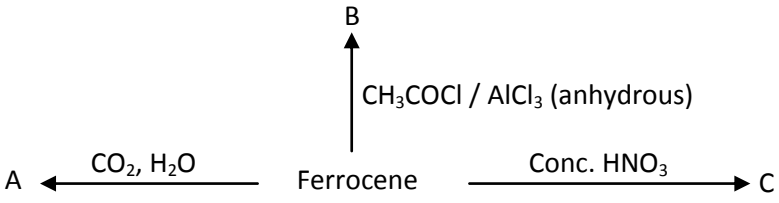
6. a) What is cis-Platin? Explain its mechanism of action as anti cancer drugs. [2+3]
   b) Briefly discuss the roles of iron and copper in the biological system and explain their toxic effect. [3+3]
   c) Write notes on (***any one***): [2]
      (i) Zinc containing redox enzymes.
      (ii) Alzheimers disease and minamata disease.

Unit-IV

(Answer <u>any one</u> question) [1×12]

7. a) Explain with examples the oxidative addition and insertion reactions. [3]
   b) Explain the role of Wilkinson's catalyst in hydrogenation of olefins at ordinary temperature and pressure. [4]
   c) Using 18 electron rule as a guide find out '*x*' in the following compounds: [3]
      (i) $Fe_3(CO)_x$ (ii) $Mn_2(CO)_x$ (iii) $Co_4(CO)_x$
   d) Rationalise the following reaction: [2]
      $Co_2(CO)_8 + 2NO \rightarrow 2Co(CO)_3(NO) + 2CO$

8. a) How ferrocene could be prepared? Identify A, B and C in the following reaction scheme: [2+3]



   b) What do you mean by 'Hydroformylation Reaction'? Mention the role of cobalt organometallics as catalyst in the above process. [4]
   c) Discuss the bonding in $[PtCl_3(C_2H_4)]^-$ anion with special reference to Pt – C_2H_4 bond. [3]

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