



Reg. No. :

Name :

Third Semester M.Sc. Degree Examination, January 2014

Branch : CHEMISTRY

CH/CL/CA 231 : Inorganic Chemistry – III
(2009 Admission)

Time: 3 Hours

Max. Marks: 75

SECTION – A

Answer **any two** among a), b) and c) from **each** question. **Each** sub-question carries **2** marks :

1. a) Suggest the possible structures for the cation in the compound, $[\text{Fe}_2(\text{NO})_6](\text{PF}_6)_2$. How can you distinguish between them ?
b) A $17e^-$ species, $\text{Mn}(\text{CO})_5$ dimerises forming $\text{Mn}_2(\text{CO})_{10}$ but another such $17e^-$ species $\text{V}(\text{CO})_6$ does not dimerise. Why ?
c) How is Zeise's salt prepared ? Give its structure.
2. a) $[\text{Ni}(\text{CN})_4]^{2-}$ is thermodynamically stable, but kinetically labile. What do you mean by this ?
b) What do you mean by DCB mechanism ? Illustrate with an example.
c) What is a photoanation reaction ? Illustrate using Cr(III) complex as an example. Suggest the mechanism.
3. a) Compare the redox properties of porphyrins and metalloporphyrins. Account for the difference.
b) Why do crown ethers show special affinity for alkali metals ions ?
c) What is Bohr effect ?
4. a) Explain the dielectric properties of insulator crystals.
b) Differentiate ferroelectric-and pyroelectric effects.
c) Which type of materials exhibit paramagnetism ? What is the unit of magnetic moment ?



5. a) The atomic mass of helium nucleus is 4.002604 amu. Calculate the binding energy per nucleon of helium nucleus. (masses are : proton = 1.008142, neutron = 1.008408, electron = 0.00055 amu)
- b) Define and differentiate half-life period and average life period of a radionuclide.
- c) Mention any 2 applications of radionuclides in agriculture. (10×2=20)

SECTION – B

Answer either **a)** or **b)** of **each** question and **each** question carries **5** marks :

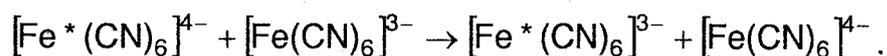
6. a) What are fluxional organometallic compounds ? Discuss the fluxionality of η^3 allyl complexes.
- b) How does cyclooctatetraene bind to metal ? Explain using an example.
7. a) What is *trans*-effect ? Using suitable examples, illustrate its synthetic uses.
- b) What are complementary and non-complementary reactions ? Explain using suitable examples.
8. a) Using suitable examples, illustrate the inhibition – and poisoning effects of metal ions in biological systems.
- b) Write a note on synthetic oxygen carriers.
9. a) What is photoconductivity ? Explain. Give two examples of photoconductors. Illustrate the use of photoconductors as detectors of radiation.
- b) Discuss the general requirements for a solid material to be used as a laser source. Mention a few important applications of lasers.
10. a) Discuss the Shell model of nucleus.
- b) What is the working principle of GM counter ? (5×5=25)



SECTION – C

Answer **any three** questions and **each** question carries **10** marks :

11. What is a hydroformylation reaction ? Give the catalytic cycles for the hydroformylation of propene using cobalt carbonyl catalyst and rhodium carbonyl catalyst and explain. What are the advantages of rhodium carbonyl catalyst.
12. Draw the potential energy diagram and explain the main features of outer-sphere electron transfer process using the following reaction :



13. What are transferrins and siderophores ? Discuss their structures and functions.
14. What is superconductivity ? Discuss one of the theories of superconductivity. Distinguish between high temperature – and low temperature superconductivity with examples. What are their applications ?
15. Write on :
 - i) Radioactive equilibrium – transient – and scalar equilibria
 - ii) Neutron activation analysis.

(3×10=30)