Reg. No. : ....

Name : ....

Third Semester M.Sc. Degree Examination, February 2015
Branch : Chemistry
CH/CL/CA 231 : INORGANIC CHEMISTRY – III
(2013 Admission)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer **two** among **(a)**, **(b)** and **(c)** from **each** question and **each** question carries **2** marks.

1. a) Which among the following have the highest CO stretching frequency in IR spectrum ?

   (i) $Ni(CO)_4$ (ii) $[Co(CO)_4]^-$ (iii) $Fe(CO)_4]^{2-}$. Justify your answer.

   b) How does sigma allyl complexes differ from Pi allyl complexes ?

   c) What are fluxional molecules ? Why NMR technique is preferred to other special techniques for studying fluxionality ?

2. a) Write down the general rate law for substitution reaction in square planar complexes which takes place via solvent pathway.

   b) Give Marcus equation and its application.

   c) The equation of $[Co(NH_3)_4Cl_2]^+$ is 10^3 times faster than that of $[Co(NH_3)_5Cl_2]^{2+}$. Why ?

3. a) Why the electron transfer process in photosynthesis is called an uphill process ?

   b) Explain the mechanism of oxygen binding in haemocyanin.

   c) What is $Na^+ – K^+$ pump ? How does it function ?

4. a) What is photoconductivity ? Give examples for photoconducting materials.

   b) Write down the applications of pyroelectricity.

   c) What are Lasers ? Give their important applications.

P.T.O.

5. a) Nuclear stability is favoured by nuclides with even number of protons and neutrons than they are odd. Why ?

b) What is a compound nucleus ? How is it formed ?

c) Give a note on breeder reactors. **(2×10=20 Marks)**

SECTION – B

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

6. a) What are metal carbonyls ? Explain the structure and bonding in $Ni(CO)_4$.

b) Discuss the mechanism of polymerization of Zeiglar-Natta catalyst.

7. a) What is trans effect ? Propose efficient routes to synthesise 'cis' and trans $[PtCl_2(NH_3)(PPh_3)]$.

b) Give an account of photochemical reactions of complexes.

8. a) Discuss the role of calcium in blood clotting process.

b) Explain the structural features of hemoglobin.

9. a) Give a brief note on dielectric properties of materials.

b) Discuss the effect of temperature on magnetism.

10. a) Distinguish between Transient and Secular equilibria.

b) What is meant by half life period ? How is it related to decay constant ? The $t_{1/2}$ of a radio nuclide is 20 years. If a sample of this nuclide has an initial activity of 8000 disintegrations per minute today, what will be its activity after 80 years ? **(5×5=25 Marks)**

SECTION – C

Answer **any three** questions. **Each** question carries **10** marks.

11. i) With suitable examples discuss the applications of Infrared spectroscopy for the elucidation of bonding in metal carbonyls.

ii) Explain the structure and bonding in butadiene complexes.

12. i) Derive the rate law expression for substitution in octahedral complexes which takes place via dissociative mechanism.

ii) Arrange the following in the order of rate of substitution by H_2O and explain the reason for your answer.

$[Co(NH_3)_6]^{3+}$, $[Rh(NH_3)_6]^{3+}$, $Ir(NH_3)_6]^{3+}$.
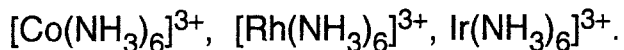
13. i) Discuss the function of PS-I and PS-II in photosynthetic activity.

ii) Outline the probable mechanistic pathways for Nitrogenase activity in nitrogen fixation.

14. Give an account of different types of magnetism.

15. Discuss about the different types of nuclear reactions with suitable examples.

(10×3=30 Marks)