Roll No. ……..

CHE–501

Inorganic Chemistry

M. Sc. CHEMISTRY (MSCCH–12/13/16)

First Year, Examination, 2017

Time : 3 Hours **Max. Marks : 80**

Note : This paper is of **eighty (80)** marks containing **three (03)** Sections A, B and C. Attempt the questions contained in these Sections according to the detailed instructions given therein.

Section–A

(Long Answer Type Questions)

Note : Section 'A' contains four (04) long answer type questions of nineteen (19) marks each. Learners are required to answer *two* (02) questions only.

1. What is the difference between symmetry element and symmetry operation ? How many different kinds of symmetry operations are there ? What are their symbols ?
2. State the postulates of crystal field theory (CFT). How are the *d*-electrons distributed between various energy levels in octahedral and tetrahedral fields ?
3. What is meant by stability of a complex ? Explain how the nature of (i) metal ion and (ii) ligand affect the stability of the complexes.
4. What is acid hydrolysis ? Discuss the mechanism in the acid hydrolysis of octahedral complexes.

Section–B

(Short Answer Type Questions)

Note : Section 'B' contains eight (08) short answer type questions of eight (08) marks each. Learners are required to answer *four* (04) questions only.

1. Write a note on abelian and non-abelian mathematical rules of group theory.
2. Describe the spectrochemical series and its correlation with π-bonding ability of ligands.
3. Write selection rules of electronic spectroscopy.
4. Predict the structure of carbonyl clusters by Wade's rule.
5. Write short notes on the following :
   (a) Dinitrogen complexes
   (b) Dioxygen complexes
6. Discuss Polarization theory of trans effect.
7. Explain with example the inner sphere mechanism of electron transfer reaction.
8. Define and discuss the labile and inert metal complexes.

Section–C

(Objective Type Questions)

Note : Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this Section are compulsory.

Choose the right answer :

1. Number of C_3 axis in PF_5 molecule is :
   (a) 2 (b) 3
   (c) 4 (d) 5

2. Which one of the following metal ions will form a stable complex ?

(a) Mn^{2+} (b) Cu^{2+}

(c) Fe^{2+} (d) Ni^{2+}

3. Which one of the following would exhibit a strong trans effect ?

(a) CO (b) NO_2^-

(c) Py (d) H_2O

4. $[Ni(CN)_4]^{2-}$ complex is :

(a) Inert (b) Labile

(c) Unstable (d) None of these

5. The complex showing the lowest value of paramagnetic behaviour is :

(a) $[Cr(CN)_6]^{3-}$ (b) $[Mn(CN)_6]^{3-}$

(c) $[Fe(CN)_6]^{3-}$ (d) $[Co(CN)_6]^{3-}$

6. Ground state term for d^6 metal ion is :

(a) ^4F (b) ^2D

(c) ^6S (d) ^3F

7. The complex ion with lowest Δ_0 value is :

(a) $[Co(NH_3)_6]^{3+}$ (b) $[CoF_6]^{3-}$

(c) $[Rh(NH_3)_6]^{3+}$ (d) $[Ir(NH_3)_6]^{3+}$

8. Oxidative-addition reactions of orangometallic compounds follow the mechanism :

   (a) S_N^2 mechanism

   (b) Concerted mechanism

   (c) Free radical

   (d) All of the three

9. Which of the following contains molybdenum iron protein ?

   (a) Anylase

   (b) Invertase

   (c) Amylase

   (d) Nitrogenase

10. Which of the following is π-acid ligand ?

   (a) CO

   (b) NH_3

   (c) H_2O

   (d) F^-