

Roll No. ....

## **CHE–501**

### **Inorganic Chemistry**

M. Sc. Chemistry (MSCCH–12/13/16)

First Year, Examination, 2017

**Time : 3 Hours**

**Max. Marks : 70**

**Note :** This paper is of **seventy (70)** 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 fifteen (15) marks each. Learners are required to answer *two* (02) questions only.

1. Explain a Symmetry operation. Discuss various symmetry elements taking suitable examples.
2. Discuss Crystal Field Theory for coordination compounds.
3. Explain the terms ‘labile and ‘inert’ in reference to coordination compounds. Discuss how the CFT and VBT have interpreted liability and inertness of these compounds.
4. Discuss the structures of Low Nuclearity and High Nuclearity carbonyl clusters.

**Section-B****(Short Answer Type Questions)**

**Note :** Section 'B' contains eight (08) short answer type questions of five (5) marks each. Learners are required to answer *six* (06) questions only.

1. Describe two evidence of presence of covalent bonding between metal and ligands.
2. Draw a character table for  $C_{3v}$  symmetry point group.
3. Describe the factors which influence the magnitude of Crystal Field Splitting.
4. Discuss the stereochemistry of reaction intermediates formed in  $S_N1$  reactions of octahedral complexes.
5. Explain applications of group theory in spectroscopy.
6. Explain how an increase in steric overcrowding around the central metal ion favours dissociative  $S_N1$  mechanism.
7. Give important properties and structure of Ferrocene.
8. Mention the reasons because of which the electronic spectra of co-ordination compounds comes out to be broad.

**Section-C****(Objective Type Questions)**

**Note :** Section 'C' contains ten (10) objective type questions of one (1) mark each. All the questions of this section are compulsory.

1. The ground term for  $d^6$  configuration of metal ion is :
  - (a)  $^6S$
  - (b)  $^5D$
  - (c)  $^4F$
  - (d)  $^1S$

2. When an oxygen molecule binds to the iron of the heme group through its coordination site, the iron becomes :
  - (a) Low spin and smaller in radius
  - (b) High spin and smaller in size
  - (c) Low spin and bigger in size
  - (d) High spin and bigger in size
3. The  $\text{Rh}_6(\text{CO})_{16}$  possess :
  - (a) Closo six vertex polyhedron structure
  - (b) Closo five vertex polyhedron
  - (c) Arachno five vertex polyhedron
  - (d) Arachno four vertex polyhedron structure
4. The frequency range of visible region  $15400\text{--}12800\text{ cm}^{-1}$  corresponds to :
  - (a) Green radiation
  - (b) Red radiation
  - (c) Blue radiation
  - (d) Yellow radiation
5. In visible part of electromagnetic radiation, which radiation is of smallest wavelength ?
  - (a) Red
  - (b) Blue
  - (c) Violet
  - (d) Green

6. Which one of the following complex ion you think should more stable ?
- (a)  $[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$
  - (b)  $[\text{Cu}(\text{trine})(\text{H}_2\text{O})_2]^{2+}$
  - (c)  $[\text{Cu}(\text{en})_2(\text{H}_2\text{O})_2]^{2+}$
  - (d) All are equally stable
7. The bonding between ligands and central metal ions is purely electrostatic is based on :
- (a) Werner's theory
  - (b) Crystal Field theory
  - (c) Ligand Field theory
  - (d) Valance Bond theory
8. The effective atomic number of Mn in  $\text{Mn}_2(\text{CO})_{10}$  should be :
- (a) 86
  - (b) 54
  - (c) 36
  - (d) 18
9. Symmetry point group for  $\text{B}_2\text{H}_6$  should be :
- (a)  $D_{6h}$
  - (b)  $D_{5h}$
  - (c)  $D_{3h}$
  - (d)  $D_{2h}$
10. In  $[\text{Co}(\text{NH}_3)_6]^{3+}$  ion, Co undergoes  $d^2 sp^3$  hybridization. The calculated spin only magnetic moment should be equal to :
- (a) 3.88 BM
  - (b) 2.83 BM
  - (c) 1.73 BM
  - (d) None of the above