M.Sc. Examination, 2018

Semester-I

Chemistry

Course: CH-702

(Inorganic Chemistry)

Time: Three Hours **Full Marks: 40**

Questions are of value as indicated in the margin.

Answer ***any four*** questions.

1. a) Why do cathodic and anodic current peaks not appear at same potential in CV? Is there any analytical importance of the peak potential difference? If so, give explanation. 3
   b) What are alkaline and acid errors and how do they affect the measured potential? 2
   c) Write down cottrel equation and define the terms involved with proper units. What is the importance of this equation from the analytical point of view? 3
   d) Describe briefly about the accurate determination of $E_{\frac{1}{2}}$ by Heyrovsky-Ilkovic method. 2

2. a) Why is potentiometry called zero current process? 1.5
   b) What are the implications of using a mercury drop in a DME? 2
   c) i) Write the synthetic route of Schrock's carbene. 1
      ii) Which type of carbene is useful as ligand in such carbene and why? 2
      iii) What will be the nature of the involved metal in this type of carbene and why? 2
   d) i) What is Tebbe's reagent?
      ii) How does it transfer $>CH_2$ group? 1.5

3. a) Show the mode of bonding in Fischer's carbene. 3
   b) "Carbene carbon is nucleophilic in Schrock's carbene" – Justify. 2
   c) Comment on the stability of $[Ti(CH_2CH_3)_4]$ and $[Ti(CH_3)_4]$. 2.5
   d) Compare the M-C bond energy in the alkyls of main group and transition elements. Give reasons. 2.5

4. a) Compare the structural features of $S_4N_4H_4$ and $S_4N_4F_4$. 2
   b) Write the reaction products of the following reactions: 2
      (i) $B_{10}H_{14} + CH_3CN \longrightarrow$
      (ii) $B_4H_{10} + NaOH \longrightarrow$
   c) Find out Styx numbers for the following compounds: 2
      (i) $B_5H_5^{2-}$; (ii) $B_3H_8^-$
   d) Describe bonding in closo-$B_6H_6^{2-}$ in term of MOT. 4

5. a) Explain the stability of the following compounds in the light of mno rule: 2+2
      (i) Fe dicarbolide; (ii) Ferrocene
   b) Predict the structure of the following compounds as per capping rule: 3
      (i) $Os_6(CO)_{18}$; (ii) $Rh_7(CO)_{16}^{3-}$ and (iv) $Os_8(CO)_{22}^{2-}$
   c) Predict the M-M bond order in the following cases as per molecular orbital theory: 3
      (i) $[Cr_2Cl_4]^{3-}$; (ii) $[Re_2Cl_4(PMe_2Ph)_4]^+$ and (iii) $[Cu(Cu_3COO)_2 \cdot H_2O]_2$

P.T.O.

6. a) Explain the origin of green colour of olivine. 2.5

   b) Draw the structure of $[Si_4O_{10}]^{4-}$ and $[Si_4O_{11}]^{6-}$. 2

   c) $(NPCl_2)_4$ is puckered but $(NPF_2)_4$ is planar – Justify. 2.5

   d) What will be $\overline{M_n}$ and $\overline{M_w}$ of a sample of a polymer that contains 5 moles of pentamer and 10 moles hexamer. 3

———