M.Sc Sem I April 2017
Chemistry : Paper II

QP Code : 03712

(2½ Hours) [Total Marks : 60

N.B. : (1) **All** questions are **compulsory.**
(2) **Figures** to the **right** indicate **full** marks.

1. (a) Attempt any **two** of the following :–
   (i) Define rate of reaction. Explain any two methods used for the determination of rate of reaction. 4
   (ii) Discuss the ligand substitution reaction in octahedral complexes without breaking of metal – ligand bond. 4
   (iii) What are electron transfer reactions ? Describe the mechanism of outer sphere electron transfer reaction. 4
   (iv) Explain the mechanism of racemization reaction in octahedral complexes. 4

   (b) Attempt any **one** of the following :–
   (i) What is trans-effect ? Explain the π - bonding theory of trans-effect. 4
   (ii) Discuss the mechanism of ligand substitution in $[FeBr_4]^-$ by Cl^-. 4

2. (a) Attempt any **two** of the following :–
   (i) Give any one method of preparation and any two characteristic reactions of transition metal alkyl complexes. 4
   (ii) With reference to Fischer carbene complexes, give– 4
      (1) any two characteristics
      (2) any one method of preparation
      (3) any two chemical reactions.
   (iii) Give any one method of preparation of dibenzene chromium (0). Explain it's structure and bonding on the basis of valence bond theory. 4
   (iv) State 16 electron rule. With the help of electron count, show which of following complexes obey the rule. 4
      (1) $[Rh(CH_3)(Br)(CO)_3]$
      (2) $[Ir(PPh_3)_3Cl]$
      (3) $[Pt(\eta^2 - C_2H_2)(PPh_3)_3]$

   (b) Attempt any **one** of the following :–
   (i) Give any one method of preparation of Zeise's salt. Draw it's structure and explain the bonding. 4
   (ii) How is ferrocene prepared by using cyclopentadienyl Grignard reagent? Give any three chemical reactions of ferrocene. 4

3. (a) Attempt any **two** of the following :-
   (i) With the help of a diagram, explain the origin of first Brillouin zone in K-space and diffraction of electron from (100) plane. 4
   (ii) Discuss the structure and salient features of Nickel arsenide. 4
   (iii) Explain the preparation of inorganic materials by ceramic method. State it's merits and demerits. 4
   (iv) Give applications of nanomaterials in the field of semiconductors and solar cells. 4

   (b) Attempt any **one** of the following :-
   (i) On the basis of the band theory, explain the conductivity of alkali and alkaline earth metals. 4
   (ii) How are nanomaterials prepared by using micro-organisms? 4

4. (a) Attempt any **two** of the following :-
   (i) Explain the electronic spectra exhibited by octahedral $[Ni(NH_3)_6]^{2+}$ complex ion. 4
   (ii) With reference to infra red spectroscopy, describe the nature of metal - nitrogen bond in metal complexes. 4
   (iii) Discuss the interpretation of ESR spectra of octahedral Cu(II) complexes. 4
   (iv) Explain the Job's variation method for the determination of stability constant of metal complexes. 4

   (b) Attempt any **one** of the following :-
   (i) With reference to Raman spectroscopy, explain the nature of metal- sulphur bond in metal complexes. 4
   (ii) Discuss the electronic spectra exhibited by square planar complexes of d^8 metal ions. 4

5. Attempt any **four** of the following :-
   (a) Describe the inner-sphere mechanism of electron transfer reactions. 4
   (b) Write a note on complementary and non-complementary reactions using examples for each. 4
   (c) Give one method for the preparation of diallyl Nickel (0) complex and give it's salient features. 4
   (d) Explain half sandwich compounds using a suitable example. 4
   (e) Discuss the structure of Cadmium chloride. 4
   (f) Describe the microwave synthesis method for the preparation of inorganic solids. 4
   (g) Explain the slope-ratio method for the determination of stability constant of metal complexes. 4
   (h) Discuss any two applications of electron spin resonance spectroscopy in inorganic chemistry. 4