

MSC I - Sem I - Oct 2016

Chemistry - Paper II - Inorg. chem.

QP Code : 77376

(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 :-

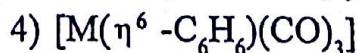
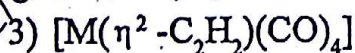
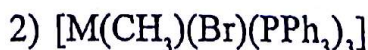
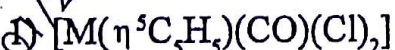
- i) With respect to octahedral complexes, explain the effect of charge of the complex and steric strain on the rate of substitution reaction. 4
- ii) Define trans-effect. Describe the electrostatic polarisation theory of trans-effect. 4
- iii) Discuss the mechanism of inner sphere electron transfer reaction in co-ordinate complexes. 4
- iv) Write a note on racemization reactions in octahedral complexes. 4

b) Attempt any one of the following :-

- i) Explain the mechanism of ligand substitution reaction in $[\text{Ni}(\text{CO})_4]$ by PEt_3 . 4
- ii) Identify the type of reaction taking place between $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{CN})_6]^{3-}$ and discuss its mechanism. 4

2. a) Attempt any two of the following :-

- i) Give any one method of preparation and two chemical properties of transition metal alkyne complexes. 4
- ii) With reference to Schrock carbene complexes, give 4
 - 1) any two characteristics.
 - 2) one method of preparation
 - 3) one chemical reaction.
- iii) On the basis of the valence bond theory, explain the structure and bonding in ferrocene. 4
- iv) Assuming that the following complexes obey 16 electron rule, with the help of electron count, identify metal 'M' belonging to 1st transition series 4



b) Attempt any one of the following :-

- i) Give any one method of preparation of dibenzene chromium (0). Draw its structure and give its salient features. 4
- ii) How is diallyl nickel (0) prepared? Explain its structure and bonding. 4

3. a) Attempt any two of the following :-

- i) Discuss the fundamentals of the band theory. On the basis of this theory, justify that beryllium is a good conductor. 4
- ii) Explain antifluorite structure in AB_2 type of compounds. 4
- iii) Describe the precursor method for the preparation of inorganic materials. State its merits and demerits. 4
- iv) Discuss the solvo-thermal method for the preparation of nanomaterials. 4

b) Attempt any one of the following :-

- i) Explain the origin of first Brillouin zone in k -space and diffraction of electrons from (100) planes with the help of a diagram. 4
- ii) Give any four applications of nanomaterials in the field of semiconductors. 4

4. a) Attempt any two of the following :-

- i) Discuss the electronic spectra observed in octahedral $[CrF_6]^{3-}$ complex ion. 4
- ii) With reference to Raman spectra, explain the nature of metal - oxygen bond in metal complexes. 4
- iii) Describe the interpretation of ESR spectra of square planar $Cu(II)$ complexes. 4
- iv) Discuss the slope - ratio method for the determination of stability constant of metal complexes. 4

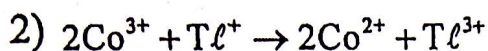
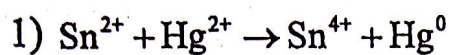
b) Attempt any one of the following :-

- i) Explain the electronic spectra exhibited in square planar $Pt(II)$ complexes. 4
- ii) Discuss the nature of metal - sulphur bond in metal complexes with reference to Infra red spectroscopy. 4

[TURN OVER]

5. Attempt any four of the following :-

a) Identify the type of the following electron transfer reactions and explain :-



b) With respect to trans-effect, discuss the effect of the following factors :

1) Nature of the solvent.

2) Nature of the leaving group.

c) Give one method for the preparation of bis (triphenyl phosphine) diphenyl acetylene platinum (0). Describe its structure.

d) Explain one method for the preparation of transition metal alkyls. Write its two chemical properties.

e) Discuss the structure and salient features of TiO_2 .

f) What are the advantages and disadvantages of ceramic method of preparation of inorganic solids?

g) Write a note on applications of ESR in biological systems.

h) Explain Job's method for the determination of stability constant of metal complexes.