

(2½ Hours)

[ Total Marks : 60

- N.B. : (1) All questions are compulsory.  
(2) Figures to the right indicate full marks.  
(3) Please check whether you have received the right question paper.

1. (a) Attempt any two of the following :

- (i) Define rate of reaction. Explain the following methods for determination of rate of reaction. 4  
(i) Spectrophotometric method (ii) Potentiometric method  
(ii) Discuss the mechanism of substitution reaction of octahedral complexes without breaking of metal-ligand bond. 4  
(iii) Explain the electrostatic polarisation theory of trans effect. 4  
(iv) Discuss the mechanism of racemisation reaction with suitable example. 4

(b) Attempt any one of the following :

- (i) Discuss the mechanism of outer sphere electron transfer reaction with suitable example. 4  
(ii) Explain the mechanism of substitution of CO by PPh<sub>3</sub> in [Ni(CO)<sub>4</sub>]. 4

2. (a) Attempt any two of following :

- (i) Give one method of preparation and two chemical properties of metal carbynes. 4  
(ii) How is dibenzene chromium prepared ? Discuss its structure and bonding on the basis of VBT. 4  
(iii) State 16 electron rule. Identify the first row transition metal M in the following complexes assuming that they obey the rule. (Give the electron count) 4  
(1) [M(CH<sub>3</sub>)(CO)<sub>4</sub>] (2) [M(η<sup>2</sup>-C<sub>2</sub>H<sub>4</sub>)(PPh<sub>3</sub>)Cl<sub>2</sub>]  
(iv) Write any one method of preparation of Zeise's salt. Draw its structure and discuss the bonding. 4

(b) Attempt any one of the following :

- (i) Differentiate between Fischer and Schrock Carbenes. 4  
(ii) Give one method of preparation of ferrocene. Discuss its structure and bonding. 4

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

- (i) Explain the conductivity property of Lithium and Beryllium on the basis of band theory. 4
- (ii) Discuss the structure and salient features of cadmium iodide 4
- (iii) Describe the precursor method for the preparation of inorganic materials. Write its merits and demerits. 4
- (iv) Describe the Solvothermal method for preparation of nanomaterials. 4

(b) Attempt any one of the following :

- (i) Describe the microwave method for the synthesis of inorganic materials. What are its merits and demerits ? 4
- (ii) Discuss the biological method for the preparation of nanomaterials. 4

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

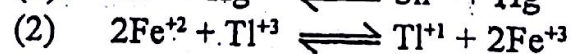
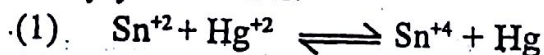
- (i) Discuss the electronic spectra exhibited by  $[\text{Ni}(\text{NH}_3)_6]^{+2}$  complex. 4
- (ii) Explain the slope ratio method for determination of stepwise formation constant of metal complexes. 4
- (iii) Discuss the ESR spectra of square planar Cu(II) complexes with the help of suitable example. 4
- (iv) With reference to Raman spectroscopy, explain the nature of metal-nitrogen bond in complexes. 4

(b) Attempt any one of the following :

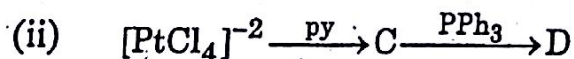
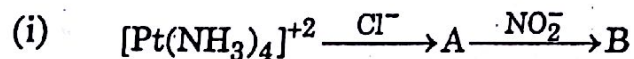
- (i) Discuss the use of IR spectroscopy to determine the nature of metal-sulphur bond in complexes. 4
- (ii) Discuss Job's method for determination of stepwise stability constant of metal complexes. 4

5. (a) Attempt any four of the following :

- (i) What are complementary and non complementary reactions ? Classify the following as complementary or non complementary. Justify your answer. 12



(b) Identify the products in the following reaction :



- (c) How is bis (triphenyl phosphine) diphenyl acetylene platinum (0) prepared. Describe its structure.
- (d) Write a note on half-sandwich compounds.
- (e) Discuss the structure and salient features of calcium fluoride.
- (f) Write a note on Sol-gel method for preparation of inorganic material.
- (g) Explain the electronic spectra of  $[Cr(NH_3)_6]^{+3}$
- (h) Write a note on use of IR spectroscopy to explain nature of Metal - oxygen bond.
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