

(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) What is rate of reaction ? Explain the photometric and conductometric methods used for the determination of rate of reaction. 4
  - (ii) Explain the ligand substitution reactions without breaking of metal - ligand bond. 4
  - (iii) Write a note on complementary and noncomplementary reactions using suitable examples. 4
  - (iv) Discuss the mechanisms of isomerization reactions. 4
- (b) Attempt any one of the following :-
- (i) What are electron transfer reactions ? Explain the outer sphere electron transfer reactions. 4
  - (ii) Define trans effect. Describe the polarisation theory of trans effect. 4
2. (a) Attempt any two of the following :-
- (i) State 16 electron rule. On the basis of electron count, show whether the following complexes obey this rule :- 4
    - (1)  $\text{RhCl}(\text{PPh}_3)_3$
    - (2)  $[\text{Pt}(\eta^3 - (\text{C}_3\text{H}_5)_2)]$
    - (3)  $[\text{Cr}(\text{en})_2\text{Cl}_2]^{+3}$
  - (ii) Give one method of preparation of bis (triphenylphosphine) diphenylacetylene platinum (0). Describe its structure. 4
  - (iii) What do you mean by sandwich compounds ? Explain the bonding in ferrocene on the basis of valence bond theory. 4
  - (iv) Describe the chemistry of metal carbenes with reference to :- 4
    - (1) One method of preparation
    - (2) One chemical reaction
    - (3) Two important applications.
- (b) Attempt any one of the following :-
- (i) How Zeise's salt is prepared ? Draw the structure and give its salient features. 4
  - (ii) Explain the structure and bonding of diallyl nickel complex. 4
3. (a) Attempt any two of the following :-
- (i) Elaborate on sol-gel method for the synthesis of inorganic materials with a suitable example. What are advantages and disadvantages of this method ? 4

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- (ii) Draw the structure of  $\text{TiO}_2$ . Comment on its salient features. 4
- (iii) Discuss the fundamentals of band theory on the basis of molecular orbital approach. 4
- (iv) Describe the term nano particles. How will you prepare cadmium sulphide nanoparticles using micro organism method? 4
- (b) Attempt any one of the following :-
- (i) On the basis of band theory, explain the electrical properties of lithium and beryllium metals. 4
- (ii) Give the applications of nanoparticles in the field of semiconductor and solar cells. 4
4. (a) Attempt any two of the following :-
- (i) Describe the slope - ratio method for the determination of stepwise formation constant of metal complexes. 4
- (ii) Explain the electronic spectra of  $[\text{Ni}(\text{en})_3]^{2+}$  ion. 4
- (iii) With reference to Raman spectroscopy, explain the nature of metal - oxygen bond in complexes using two examples. 4
- (iv) Discuss the electronic spectra and the transition exhibited in  $[\text{CrF}_6]^{3-}$  complex ion. 4
- (b) Attempt any one of the following :-
- (i) Explain four applications of ESR spectroscopy in biological systems. 4
- (ii) With reference to Infra - Red spectroscopy discuss the nature of metal - sulphur bond in inorganic complexes. 4
5. Attempt any four of the following :- 12
- (a) Write a note on inner sphere mechanism with one suitable example.
- (b) With respect to rate of reaction explain :-
- (i) effect of the leaving group
- (ii) effect of strain.
- (c) Draw the structure of dibenzene chromium and comment on its salient features.
- (d) Write a note on half - sandwich compounds with two examples.
- (e) Give the structure and salient features of cadmium iodide.
- (f) Explain the term precursor. Give the preparation of an inorganic material by this method.
- (g) Write the three important applications of ESR spectroscopy in the field of inorganic chemistry.
- (h) Draw electronic spectra of  $[\text{Ni}(\text{CN})_4]^{2-}$  complex ion. Give its salient features.

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