

PG (CBCS) EVEN SEMESTER EXAMINATION, 2023

CHEMISTRY

4th Semester

Course No. : CHMCC - 403 (A)

(Inorganic Chemistry-IV)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

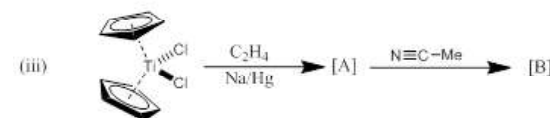
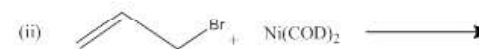
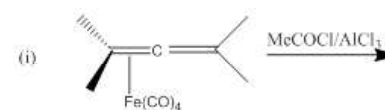
The figures in the margin indicate full marks for the questions

(Answer five questions, selecting one from each unit)

UNIT-I

1. (a) Furnish two synthetic routes to Metal-butadiene complex. Illustrate the structure and bonding in Metal-butadiene complexes. 2+3=5

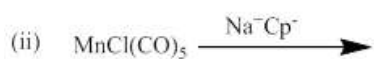
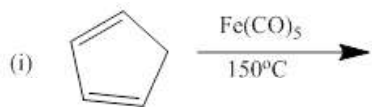
- (b) Complete the following reactions (Give structures). 3×1=3



(Turn Over)

(2)

- (c) Discuss different factors affecting the back donation in metal-alkene organometallic complexes. 4
- (d) Write the applications of alkyne complexes in 2
- (i) Pauson-Khand reaction
- (ii) [2+2+2] cycloaddition reaction
2. (a) Show two synthetic strategies to obtain ferrocene. Describe the structure and bonding in ferrocene complexes. 2+3=5
- (b) Explain the use of Cp_2Fe/Cp_2Fe^+ couples in biosensors. 3
- (c) Complete the following reactions 2



- (d) Describe the synthesis of cyclooctatetraenyl complexes. 2
- (e) Show the mechanism for isotactic synthesis of propylene using bent sandwich bis indenyl ansa-metallocene catalyst. 2

UNIT-II

3. (a) Which excited state is responsible for ligand photo-substitution reaction in metal complexes? Discuss

(5)

UNIT-V

9. (a) What is crystal engineering? What is the need to study crystal engineering? 2
- (b) Discuss the following terms with example. 3
- (i) Building block
- (ii) Supramolecular synthon
- (iii) Secondary building unit
- (c) Briefly discuss the crystal packing in the compound $[Ag_2(4,4'-bpy)_2](BF_4)_2 \cdot 2H_2O$ 3
- (d) Resorcinol forms polymorphic crystals by changing temperature. Explain. 3
- (e) Pyrazine-2-carboxamide crystal can be bent and the bending is strongly anisotropic. Explain. 3
10. (a) Describe the following terms used in crystallization. 3 x 2 = 6
- (i) Nucleation
- (ii) Supersaturation
- (iii) Crystal growth
- (b) Define coordination polymer. Classify coordination polymer based on dimensionality and their molecularity. 3
- (c) Find out the Wells symbol and point symbol of a square net. 2
- (d) Briefly discuss the Kitagawa classification of porous coordination polymer. 3

★★★

(4)

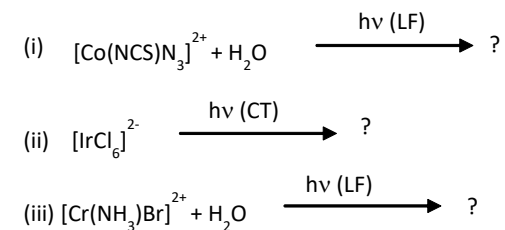
- (b) Write a brief account on radioimmunoassay. 3
- (c) Describe the Szillard-Chalmers neutron capture reaction and separation of radioisotopes. 7
6. (a) Illustrate ion-exchange method. Describe the application of ion-exchange technique in lanthanides, actinides and transition metal ion separation. 2+5=7
- (b) Furnish an example of isotope exchange reaction. Derive the rate of a chemical exchange reaction assuming an equilibrium condition. 1+6=7

UNIT-IV

7. (a) "Co(III) centre (low spin) is kinetically inert, but the Co-C bond is labile in different enzymatic reactions effected by vitamin B₁₂" Explain. 4
- (b) What are the cytochromes? How do you classify the cytochromes on the basis of porphyrin ring and spectral data. 2+5=7
- (c) Comment on important structural features of carboxypeptidase-A (CPA) 3
8. (a) What is superoxide dismutase (SOD)? Comment on the structure forming role of Zn²⁺ in Cu, Zn-SOD. Discuss the mechanism of Cu, Zn-SOD activity. 1+2+4=7
- (b) Discuss the structure and activity of carbonic anhydrase. Name the potential inhibitors towards carbonic anhydrase. 6+1=7

(3)

- explaining two examples, the nature of such an excited state in photochemistry. 1+3=4
- (b) Write the products and comment. 3x2=6



- (c) Explain 'Thexi' state and its relevance in photochemistry of metal complexes. 4
4. (a) Write short notes on. 2x3=6
- (i) Non-radiative transition
- (ii) Triboluminescence
- (b) Explain the product formation of photochemical reaction $[\text{Co}(\text{NH}_3)\text{N}_3]^{2+}$ in aqueous solution when irradiated with energies (hv) in the ligand-field and charge-transfer region 4
- (c) Furnish a short account of actinometry citing one suitable example. 4

UNIT-III

5. (a) What is isotropic tracer method? Give the limitations of radioactive tracer methods. 1+3=4

(Turn Over)