

**M. Sc. DEGREE END SEMESTER EXAMINATION : MARCH 2023**  
**SEMESTER 2 : CHEMISTRY / PHARMACEUTICAL CHEMISTRY**  
**COURSE : 21P2CHET05 / 21P2CPHT05: INORGANIC CHEMISTRY - II**  
*(For Regular - 2022 Admission and Supplementary - 2021 Admission)*

Duration : Three Hours

Max. Weights: 30

**PART A****Answer any 8 questions****Weight: 1**

1. Explain why acetylacetonate ligand forms more stable metal complexes. (A, CO 1)
  2. Illustrate Jahn- Teller stabilization energy by taking  $d^9$  ion as an example. (A)
  3. Though d-d transitions are forbidden transitions, very low intensity transition is observed in metal complexes. Why? (A)
  4. Silica gel contains  $[\text{CoCl}_4]^{2-}$  as an indicator. When activated silica gel becomes dark blue while upon absorption of moisture its colour changes to pale pink. Give explanation for this observation. (A)
  5. What is the basis of Guoy method? (R, CO 2)
  6. When two isomers of  $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$  reacts with thiourea, one product is  $[\text{Pt}(\text{tu})_4]^{2+}$  and the other is  $[\text{Pt}(\text{NH}_3)_2(\text{tu})_2]^{2+}$ . Identify the initial isomers and explain the results. (U, CO 3)
  7. The substitution reaction of  $[\text{Pt}(\text{PMe}_3)_2(\text{Cl})_2]$  with  $\text{NH}_3$  is 100 times faster than the substitution reaction of  $[\text{Pt}(\text{PPh}_3)_2(\text{Cl})_2]$  with  $\text{NH}_3$ , why? (A, CO 3)
  8. How will you assign  $\Delta$  and  $\Lambda$  configuration to  $[\text{Co}(\text{en})_3]^{3+}$ . (A, CO 4)
  9. Actinide contraction is greater from element to element than lanthanide contraction. Why? (An)
  10. Write the Lande equation. Explain the terms involved. (U)
- (1 x 8 = 8)**

**PART B****Answer any 6 questions****Weights: 2**

11. The coordination number of Hg decreases from 6 to 4 when it forms chloro complex from its aqua complex. Explain (An, CO 2)
12. The spectrum of  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$  consists of a broad band with a shoulder in the lower energy side. Explain. (A, CO 1)
13. Discuss the Laporte selection rule for electronic transition in metal complexes. Discuss the relaxations to this selection rule. Arrange the following complexes in the increasing order of intensity of d – d transitions in the complexes of a 3d transition metal ion. Give explanation. (A)  
 $[\text{M}(\text{H}_2\text{O})_6]^{2+}$ , cis -  $[\text{M}(\text{H}_2\text{O})_4(\text{Cl})_2]$  and trans -  $[\text{M}(\text{H}_2\text{O})_4(\text{Cl})_2]$
14. Why  $\text{MnO}_4^-$  ion is intensely coloured? What are the various transitions responsible for its colour? (A)
15. Explain conjugate base mechanism of base hydrolysis. What are the advantages of this mechanism? (U)

16. Explain Taube mechanism for inner sphere electron transfer reaction. (U, CO 3)  
Discuss about the factors which influence the reaction rate.
17. Write briefly on cyclopentadienyl complexes of lanthanides. (U)
18. Write briefly on the colour exhibited by lanthanides. (An)  
**(2 x 6 = 12)**

**PART C**

**Answer any 2 questions**

**Weights: 5**

19. Explain in detail about the different sigma and pi bonding ligands with suitable example by giving emphasis to Molecular orbital diagram. (A, CO 2)
20. What are Orgel diagrams? Draw the Orgel diagrams for  $d^1$ ,  $d^2$ ,  $d^3$  and  $d^9$  systems in both octahedral and tetrahedral fields. What is Tanabe sugano diagram? How it is superior to Orgel diagram? (A)
21. What is trans effect? Discuss the different theories proposed for explaining the trans effect. Using trans effect series as a guide, outline the synthesis of geometrical isomers of  $[Pt(Cl)(Br)(Py)(NH_3)]$  starting from  $[Pt(Cl)_4]^{2-}$  and other ligands. (A, CO 3)
22. What is linkage isomerism? Discuss the different factors that influence linkage isomerism. (An)  
**(5 x 2 = 10)**

**OBE: Questions to Course Outcome Mapping**

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 1	Understand the structural and bonding aspects of co-ordination compounds.	U	1, 12	3
CO 2	Explain the spectral and magnetic properties of metal complexes.	A	5, 11, 19	8
CO 3	Explain the thermodynamic and kinetic aspects of reactions of metal complexes.	U	6, 7, 16, 21	9
CO 4	Understand the stereochemistry of co-ordination compounds.	U	8	1

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;