Reg. No ..... Name **21P2005**

M. Sc DEGREE END SEMESTER EXAMINATION - JULY 2021

SEMESTER 2 : CHEMISTRY / PHARMACEUTICAL CHEMISTRY

COURSE : **16P2CHET05 / 16P2CPHT05 : INORGANIC CHEMISTRY - II**

(For Regular - 2020 Admission and Supplementary 2019/2018/2017/2016 Admissions)

Time : Three Hours Max. Marks: 75

PART A

Answer any 10 (2 marks each)

1. Pd(II) and Pt(II) metal ions prefer to form square planar complexes, while Ni(II) forms octahedral complexes. Give the reason.
2. Fluoride complexes of alkaline earth metal cations are more stable? Why?
3. Which can be easily converted by rotation through 90^0, the three unoccupied t_2g orbitals or the two unoccupied eg orbitals? Why?
4. Discuss how the magnetic susceptibility of antiferromagnetic materials vary with temperature.
5. 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.
   $[M(H_2O)_6]^{2+}$, *cis* - $[M(H_2O)_4(Cl)_2]^{2+}$ and *trans* - $[M(H_2O)_4(Cl)_2]^{2+}$
6. The complex $[Hg(CN)_4]^{2-}$ is labile as well as thermodynamically stable, why?
7. Is the reaction $[Co(NH_3)_6]^{3+}$ + $[Cr(H_2O)_6]^{2+}$ likely to proceed by an inner-sphere or outer-sphere mechanism? Explain your answer.
8. Why nickel complexes are observed to undergo substitution much faster than platinum complexes?
9. What is ORD?
10. Explain positive and negative cotton effect curves.
11. How will you assign Δ and $\wedge$ configuration to $[Co(en)_3]^{3+}$.
12. What is lanthanide contraction?
13. Suggest an efficient method and the principle employed in the separation of lanthanides.

(2 x 10 = 20)

PART B

Answer any 5 (5 marks each)

14. Explain the d orbitals splitting in square pyramidal and triagonal bi pyramidal fields?
15. The complexes $[Mn(H_2O)_6]^{2+}$, $[Fe(H_2O)_6]^{3+}$, $[MnCl_4]^{2-}$ and [FeCl4]2- all have magnetic moments of nearly 5.92 BM. What does this tell you about the geometric and electronic structures of these complexes? Why is the spin only formula so precise in these cases?
16. Discuss how antiferromagnetism is observed in metal oxides.
17. The electronic spectrum of $KMnO_4$ shows a broad band at 18000 cm^{-1} while in K_2CrO_4 the band is observed at higher frequency 26000 cm^{-1}. Assign the bands and explain the trend.
18. What are the factors affecting the rate of water exchange reaction. Explain the different classes of complexes on the basis of rate of water exchange reactions.
19. How the acid hydrolysis of cis $[Co(en)_2Cl(OH)]^{+}$ complex differ from its trans complex. (en = ethylene diamine)
20. How will you determine absolute configuration of a complex by ORD and CD.
21. Write briefly on asymmetric synthesis catalyzed by coordination complexes.

(5 x 5 = 25)

PART C

Answer any 2 (15 marks each)

22. Discuss briefly the CF theory of octahedral complexes. Illustrate With suitable examples how this theory is useful in explaining the spectral and magnetic properties of complexes? What are the shortcomings of this theory?

23. a) 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. (10 Mark)
    b) What is Tanabe sugano diagram? How it is superior to Orgel diagram? (5 Mark)

24. Discuss briefly the mechanism of outer – sphere and inner sphere electron transfer reactions. How can Marcus theory be used to explain outer sphere electron transfer reactions?

25. Give an account on the colour and spectra exhibited by lanthanides.

(15 x 2 = 30)