20P2005

Reg. No ..... Name .....

M. Sc DEGREE END SEMESTER EXAMINATION - MARCH 2020

SEMESTER 2 : CHEMISTRY / PHARMACEUTICAL CHEMISTRY

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

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

Time : Three Hours Max. Marks: 75

Section A
Answer any 10 (2 marks each)

1. Give the d orbital splitting in the triagonal and square pyramidal fields.
2. The stability of complexes of Ag^{+} with bidentate ligands is generally low compared to that of metals such as Cu^{2+}. Give reason.
3. Three bands in the electronic spectrum of $[Cr(NH_3)_6]^{3+}$ are due to the following transitions. Which transition has lowest intensity and why?
   a) $^4A_{2g} \rightarrow {}^4T_{1g}$ b) $^4A_{2g} \rightarrow {}^4T_{2g}$ and c) $^4A_{2g} \rightarrow {}^2E_g$
4. Though d-d transitions are forbidden transitions, very low intensity transition is observed in metal complexes. Why?
5. Discuss how the magnetic susceptibility of ferromagnetic materials vary with temperature
6. Substitution reaction in square planar complexes are stereoretentive, why?
7. From the following identify the complex having fastest electron transfer during the reduction with $[Cr(H_2O)_6]^{2+}$. Give explanation for your answer.
   $[Co(NH_3)_5Cl]^{2+}$, $[Co(NH_3)_5Br]^{2+}$, $[Co(NH_3)_5I]^{2+}$
8. The base hydrolysis of red isomer of $[Co(tren)(NH_3)(Cl)]^{2+}$ is much more faster the base hydrolysis of purple isomer of $[Co(tren)(NH_3)(Cl)]^{2+}$, Why? (tren = tris(2-amino ethyl) amine)
9. Explain linkage isomerism with an example.
10. Explain fac and mer isomerism with a suitable example.
11. Which of the following are chiral?
    a) $[Cr(ox)_3]^{3-}$, b) cis- $[Rh\ Cl_2\ (NH_3)_4]^{+}$ c) cis- $[Pt\ Cl_2\ (en)]$ d) $[Ru\ (bipy)_3]^{2+}$
12. Work out the number of unpaired electrons in Ce^{4+}, Yb^{2+}, Gd^{3+} and Tb^{4+}.
13. Lanthanides are less prompt to form complexes than d- block elements. Why?

(2 x 10 = 20)

Section B
Answer any 5 (5 marks each)

14. The stepwise stability constants k_1 and k_2 of ethylene diamine complex for divalent ions show a regular increase from Mn to Zn, but for k_3, Cu^{2+} shows striking difference. Explain the reason
15. Arrange the following complexes in the incresing order of energies of charge transfer bands with explanation.
    $[CoCl_4]$, $[CoBr_4]$ and $[CoI_4]$
16. The absorption spectrum of $(CoF_6)^{3-}$ shows a single broad band which splits into two distinct peaks. Explain.

17. Solutions of $[Cr(H_2O)_6]^{3+}$ ions are pale blue green. But the chromate ion CrO_4^{2-} is an intense yellow. Characterise the origin of transition and explain the relative intensities.
18. Explain the associative mechanism of octahedral substitution. Derive the rate expression.
19. Explain Marcus theory. How it is used for studying the rate of self – exchange reaction?
20. Discuss the resolution method of chiral metal complexes with a suitable example.
21. Explain Symbiosis with suitable examples.

(5 x 5 = 25)

Section C
Answer any 2 (15 marks each)

22. Apply the MO theory for the complex $[Co(NH_3)_6]^{3+}$ and construct the Molecular orbital energy level diagram.
23. a) Discuss the selection rule for electronic transition in Metal complexes. Discuss the relaxations to this selection rules.
    b) How does d-d transition differ from CT transition on the basis of nature and Intensity? Explain the reason for the difference.
24. (a) What is trans effect? Discuss the different theories proposed for explaining the trans effect.
    (b) 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.
25. Compare the coordination chemistry and complex forming ability of lanthanides with transition elements

(15 x 2 = 30)