(NO. OF PAGES: 2)

(FOR THE CANDIDATES ADMITTED **21PCY204**

DURING THE ACADEMIC YEAR 2021 ONLY) **REG.NO. :**

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : JULY 2022

M.Sc.-CHEMISTRY **MAXIMUM MARKS: 70**

II SEMESTER **TIME : 3 HOURS**

INORGANIC CHEMISTRY-II
CO-ORDINATION AND ORGANOMETALLIC CHEMISTRY

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS. **(K1)**

1. What will be the coordination number and oxidation state of $FeCl_2$ in water?
   a) 2, +2 b) 6, +2 c) 6, 0 d) 8, +2
2. The lowest energy term for the d^8 configuration is_____.
   a) ^3D b) ^5S c) ^3F d) ^3P
3. The reaction of $[PtCl_4]^{2-}$ with two equivalents of NH_3 gives_____.
   a) trans-$Pt(NH_3)_2Cl_2$ b) $Pt(Cl_4)^{2-}$
   c) $Pt(NH_3)_4^{2-}$ d) cis-$Pt(NH_3)_2Cl_2$
4. Among the following, the correct statement is_____.
   a) CH_2 is isolobal to $Ni(CO)_2$ b) CH is isolobal to $Co(CO)_3$
   c) CH is isolobal to $Fe(CO)_4$ d) CH_2 is isolobal to $Mn(CO)_4$
5. Which of the following is Zeise's salt?
   a) $[Pt(C_2H_4)Cl_3]^-$ b) $[Pd(C_2H_4)Cl_3]^-$
   c) $[Pt(C_2H_4)_2Cl_2]^-$ d) cis-$Pt(NH_3)_2Cl_2$

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES **(K2)**

6. Define crystal field stabilization energy.
7. Give any one example for LMCT.
8. Illustrate any one inorganic reaction which follows outersphere mechanism.
9. Draw the structure of $Fe_2(CO)_9$.
10. Illustrate any one preparation of metal alkyne complex.

SECTION – B (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) Calculate CFSE for the following:
    i) $[Cr(H_2O)_6]^{2+}$ ii) d^5 configuration (octahedral, low spin)

(OR)

b) Describe chelate effect with examples.

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12. a) Calculate ground state term for the following configuration:
i) d^2 ions ii) d^5 (high spin)

(OR)

b) Describe briefly Nephelauxetic effect and its consequences.

13. a) Examine the dissociative mechanism in substitution reaction of octahedral complexes.

(OR)

b) Describe briefly the π-bonding theory of *trans*-effect.

14. a) Describe the structural elucidation of metal carbonyl halides.

(OR)

b) Arrange the following metal carbonyls in decreasing order of CO stretching vibrational frequency and give your reason.
$[Ti(CO_6)]^{2-}$, $[Cr(CO_6)]$, $[V(CO_6)]^-$

15. a) Describe any two methods of preparation of metal allyl complexes.

(OR)

b) Examine the reaction of an alkene, alkyne and CO in presence of $Co_2(CO)_8$.

SECTION - C (4 X 10 = 40 MARKS)

ANSWER ANY FOUR OUT OF SIX QUESTIONS
(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS (FROM Qn. No : 17 to 21)
(K4 (Or) K5)

16. Outline the factors affecting the magnitude of Δ.

17. Summarize the important assumptions of CFT.

18. Draw and explain Orgel diagram for d^1 system in octahedral complex.

19. Discuss briefly the mechanism of nucleophilic substitution reaction in square planar complex.

20. i) Write a note on bonding in metal nitrosyl complex.
ii) Identify the following as closo/nido/arachno using Wade's rule.
A) $Rh_6(CO)_{16}$ B) $[Co_6(CO)_{15}]^{2-}$

21. Explain in detail synthesis, bonding and any two reactions of ferrocene.

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