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

M.Sc. DEGREE END SEMESTER EXAMINATION OCTOBER - NOVEMBER 2016

SEMESTER **– 1: CHEMISTRY / PHARMACEUTICAL CHEMISTRY**

COURSE: **P1CHET01-P1CPHT01 – ORGANOMETALLICS AND NUCLEAR CHEMISTRY**

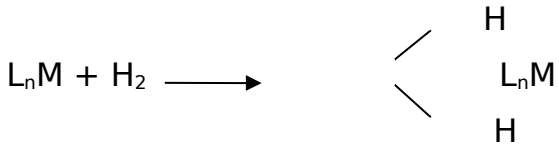
(For Supplementary / Improvement 2015 Admission)

Time: Three Hours Max. Marks: 75

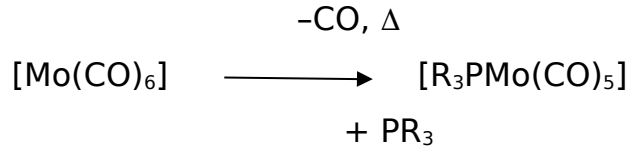
SECTION A

(Answer any 10 questions. Each question carries 2 marks)

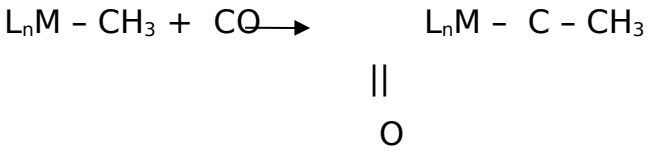
1. Assuming that the complexes $[M(CO)_3(NO)]$ and $[M'(CO)_2(NO)_2]$ obey the 18 electron rule, name the metals M and M' from the 3d transition series and give their oxidation states in the complexes.
2. Calculate the metal VEC in the following compounds:
   $[Ni(C_4H_4)_2]$, $[Co(\eta^5\text{-}C_5H_5)(C_3H_3)]^+$
3. Which of the following fragments are isolobal? Justify the answer.
   (a) $Co(CO)_4$ (b) $Ni(CO)_3$ (c) $Mn(CO)_5$ (d) $Co(CO)_3$
4. Give different bonding modes possible between transition metals and dinitrogen.
5. Write the most probable mechanism of the reaction given below and name the type of reaction where M is a transition metal.



6. Give a reasonable mechanism of the following reaction:



7. Name the type of the following reaction and outline the various steps involved:



where M is a transition metal.

8. Give two typical organometallic dendrimers.
9. Manganese is involved in many enzymatic processes. Name two such enzymes containing manganese.
10. Explain the term biological calcification.
11. Distinguish between vitamin B_{12a}, B_{12r} and B_{12s}.
12. What are breeding nuclear reactions? Give one example.
13. What is meant by positron anihilation?

(10 x 2 = 20)

SECTION B

(Answer any 5 questions. Each question carries 5 marks).

14. Using a typical MO diagram show that in Schrok carbenes HOMO is localized mainly upon the carbene carbon and LUMO is localized on the metal.
15. Give two important bonding modes possible for 1, 4-butadiene involving the π-electrons with transition metals and explain their bonding characteristics.
16. Explain the stereo chemical non-rigidity of the following types of organometallic compounds using typical examples.
    (a) metal bonded polyenes
    (b) polynuclear metal carbonyls.
17. $AlCl_3$ + alkylaluminium chloride is a good Zeigler-Natta catalyst whereas $NilCl_2$ + alkylaluminium chloride is not a good Zeigler-Natta polymerisation catalyst. Explain why?
18. Write briefly on the synthesis and structure of condensation polymers based on ferrocene.
19. Explain any the biological functions of ferritin and transferrin.
20. What are ferredoxins? Explain their important biological functions.
21. Explain the principle of neutron activation analysis.

(5 x 5 = 25)

Section C

(Answer any 2 questions. Each question carries 15 marks)

22. Sketch the MO diagram of metallocenes and show that vanadocene and chromocene are paramagnetic whilest ferrocene is diamagnetic.

23. What are the three important criteria needed for a Wilkinson type homogeneous hydrogenation catalyst? Discuss the mechanism of hydrogenation of olefins using $[RhCl(PPh_3)_3]$ with clear emphasis on the role of Rh, Cl and PPh_3 in the process.

24. (a) Explain how chlorophyll a absorb light energy and the absorbed energy transferred to the reaction centers?

(b) Discuss how PS II releases O_2 through photosynthesis?

25. Discuss the salient features of different types ionization chamber instruments used for the detection and measurement of nuclear radiations.

(15 x 2 = 30)

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