

15P310

(Pages:2)

Name.....

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2016

(CUCSS - PG)

(Chemistry)

CC15P CH3 C10 - Organometallic and Bioinorganic Chemistry

(2015 Admission)

Time: Three Hours

Maximum: 36 Weightage

**Section A**

(Answer *all* questions. Each question carries *1 weightage*)

1. Find the total number of electrons considered to be involved in the formation of the cluster,  $\text{Fe}_5(\text{CO})_{15}\text{C}$ .
2. Explain oxo reaction with an example.
3. Distinguish between Fischer and Schrock carbene.
4. Arrange the following iron carbonyls in the increasing order of IR stretching frequency.  $\text{Fe}(\text{CO})_4^{2-}$ ,  $\text{Fe}(\text{CO})_4^{2+}$ ,  $\text{Fe}(\text{CO})_5$ . Justify your answer.
5. Why there is a need to increase  $\text{H}_2$  concentration in a water gas shift reaction.
6. Write a short note on fluxional organometallic compounds.
7. Write in the increasing order of  $\pi$ -acidity in the following ligands:  $\text{C}_2\text{F}_4$ ,  $\text{NEt}_3$ ,  $\text{CO}$  &  $\text{C}_2\text{H}_4$ . Justify.
8. What are isolobal fragments. Give examples.
9. Why is  $\text{Zn}^{2+}$  employed rather than  $\text{Cu}^{2+}$  in enzymes which are involved acid catalysis.
10. Does dioxygen binding affect the spin state of iron in haemoglobin? Substantiate.
11. Give an account of nitrogen fixation by nitrogenase.
12. Which one gets saturated with oxygen at a faster rate; haemoglobin or myoglobin. Give reasons.

(12 x 1 = 12 weightage)

**Section B**

(Answer *any eight* questions. Each question carries *2 weightage*)

13. Why dinitrogen complexes are few even though it is iso electronic with CO and nitrosyl. Also discuss the bonding modes of dinitrogen complexes.
14. Write a short note on hydride and dihydrogen complexes.
15. Explain the structure and bonding in any  $\text{C}_5\text{H}_5^-$  system.
16. Write a note on the insertion reaction of CO &  $\text{SO}_2$ .
17. Discuss Monsanto acetic acid process. How is it differ from Cativa process?
18. Using Wade's rule, discuss the structure of  $\text{Rh}_6(\text{CO})_{16}$  and  $\text{Os}_5(\text{CO})_{16}$ .
19. Describe the structure and function of cytochrome P-450.
20. What are the special characteristics of Vitamin  $\text{B}_{12}$  which differentiate it from other proteins.

21. Discuss the application of metal complexes as drugs.
22. Discuss the role of transferrin and ferritin in iron metabolism.
23. What is hemerythrin? Discuss the structure and function.
24. The substitution reactions of  $[\text{IrCl}(\text{CO})(\text{PPh}_3)_2]$  with triethyl phosphine are associatively activated. Discuss.

(8 x 2 = 16 weightage)

### Section C

(Answer *any two* questions. Each question carries 4 weightage)

25. Explain (a) oxidative addition (b) reductive elimination (c) insertion and (d) substitution reactions with examples.
26. Briefly explain (a) hydrogenation by Wilkinson's catalyst and (b) Carbonylation by Collman's reagent.
27. (a) Discuss quadruple bond in non carbonyl clusters and (b) Discuss the structure and reactions of any two fullerene complexes.
28. Discuss the function of sodium-potassium pump in biological systems. How does vanadate ion interfere with the action of sodium-potassium pump.

(2 x 4 = 8 weightage)

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