C 82389 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2015

(CUCSS)

Chemistry

CH 4E 08—BIOINORGANIC AND ORGANOMETALLIC CHEMISTRY

Time : Three Hours Maximum : 36 Weightage

Part A

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

1. What are ionophores ? How are they classified ?
2. Define entatic state. What is its necessity in metalloenzymes ?
3. Why is Zn^{2+} employed rather than Cu^{2+} in enzymes, which are involved in acid catalysis ?
4. Does dioxygen binding affect the spin state of iron in haemoglobin ? Substantiate your answer.
5. Which one gets saturated with oxygen at a faster rate; haemoglobin or myoglobin ? Give reasons for your answer.
6. What is the role of Mn in photosynthesis ?
7. What is the cause for Wilson's disease ? How is it treated ?
8. State and explain 18-electron rule as applied to organometallic compounds.
9. $V(CO)_6$ is a fairly stable compound; but it can be easily reduced to $[V(CO)_6]$; why ?
10. What is carbonylation reaction ? Explain with an example.
11. What is agostic interaction ? Explain with a suitable example.
12. Which is the catalyst used in oxo process ? Mention some important defects of this catalyst.
13. Explain the mechanism of reductive elimination reaction.
14. What are zeolites ? Give one example for a zeolite based heterogeneous catalysis.

(14 × 1 = 14 weightage)

Part B

Answer any **seven** *questions.*
Each question carries 2 *weightage.*

15. Explain how oxidation state and coordination environment of cobalt in vitamin B_{12} suits its biological role.
16. Differentiate between active transport and passive transport across biological membrane.

Turn over

17. Describe the structure and function of cytochrome P_{450}.
18. What is hemerythrin ? Discuss its structure and functions.
19. Write an account on the toxic effect of iron in human beings.
20. Illustrate with suitable examples, how *hapto* notations are used in naming organometallic compounds ?
21. Discuss the synthesis, structure and reactivity of dioxygen metal complexes.
22. Write a note on the insertion reactions of CO and SO_2.
23. Adding PPhs to a solution of Wilkinson's catalyst reduces the turn over frequency for the hydrogenation of propylene. Explain this observation in terms of the mechanism of the catalyst.
24. Bring out the mechanism of polymerisation of ethylene using Ziegler-Natta catalyst.

(7 × 2 = 14 weightage)

Part C

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

25. Describe *in-vivo* nitrogen fixation by nitogenase bringing out the structure and functions of nirtogenase. Give a synthetic model for biological nitrogen fixation.
26. Discuss the function of sodium-potassium pump in biological system. How does vanadate ion interfere with the action of sodium-potassium pump ?
27. Describe the catalytic cycle and mechanism of the reactions involved in Monsanto acetic acid process.
28. How dinitrogen complexes of Ru and Co are prepared ? Explain the bonding modes of dinitrogen in mononuclear transition metal complexes. Discuss the role of dinitrogen complexes in nitrogen fixation.

(2 × 4 = 8 weightage)