

FOURTH SEMESTER P.G. DEGREE EXAMINATION, MARCH 2020

(CCSS)

Applied Chemistry

ACH 4E 05—BIOINORGANIC CHEMISTRY

(2015 Admissions)

Time : Three Hours

Maximum : 80 Marks

Section A

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

- Which of the following complex ion is expected to be labile to ligand substitution reactions ?
 - $[\text{Ir}(\text{NH}_3)_6]^{3+}$
 - $[\text{Mo}(\text{NH}_3)_6]^{3+}$
 - $[\text{Ni}(\text{en})_3]^{2+}$
 - $[\text{Co}(\text{NO}_2)_6]^{3-}$
- The most abundant element present in human body is _____.
 - C.
 - Si.
 - O.
 - Fe.
- For passive transport, free energy change is _____.
 - Negative.
 - Positive.
 - Zero.
 - Depends on the membrane.
- Entatic state corresponds to _____.
 - Increased activation energy.
 - Distorted condition
 - Change in conformation.
 - None of the above.
- In oxyhaemoglobin iron centre is described by _____.
 - High spin Fe(III).
 - High spin Fe(II).
 - Low spin Fe(III).
 - Low spin Fe(II).

6. What is Bohr effect ?
- (a) pH dependence of myoglobin.
 - (b) pH dependence of hemoglobin.
 - (c) pH dependence of both hemoglobin and myoglobin.
 - (d) Concerned with atom model.
7. The metal present in SOD and hemocyanin is _____.
- (a) Zn.
 - (b) Te.
 - (c) Mn.
 - (d) Cu.
8. Hemocyanin belongs to the group of :
- (a) Non-heme iron protein.
 - (b) Heme iron protein.
 - (c) Non-heme copper protein.
 - (d) Heme copper protein.
9. The structure of cis-platin is :
- (a) Tetrahedral.
 - (b) Square planar.
 - (c) Octahedral.
 - (d) Trigonal pyramidal.
10. Which of the following metal complex is used in MRI ?
- (a) La(III).
 - (b) Ce(IV).
 - (c) Lu(III).
 - (d) Gd(III).
11. Metal ions present in nitrogenase are _____.
- (a) Zn and Fe.
 - (b) Mg and Zn.
 - (c) Cu and Fe.
 - (d) Fe and Mo.
12. In photosynthesis, the metals involved are _____.
- (a) Mg and Mn.
 - (b) Fe and Co.
 - (c) Na and Mg.
 - (d) Mn and Cu.

(12 × 1 = 12 marks)

Section B

Answer all questions.

Each question carries 2 marks.

13. Explain the role of metal ions in stabilising cell membrane.
14. An ionophore having two carboxylic acid groups at the periphery can transport both K^+ and Ca^{2+} , depending on the pH value ; Explain.
15. Comment on the magnetic property of hemoglobin and oxyhemoglobin.
16. Electron transfer in plastocyanin is highly favoured ; why ?
17. Which is safer; milk tea or lime tea ? Explain in the light of aluminium toxicity.
18. What do you mean by 'red drop' in photosynthesis ?

(6 × 2 = 12 marks)

Section C

Answer any six questions.

Each question carries 6 marks.

19. Compare the similarities between copper and iron in biological processes.
20. Write a note on DNA replication.
21. Discuss the role of calcium in blood clotting process.
22. Explain the structure and functions of catalase, peroxidase and carbonic anhydrase
23. How cytochromes are classified ? Explain the structure and functions of cytochrome P_{450} ?
24. What are the effects of copper overloading in human beings ? How is it manifested ?
25. Give an account of the blue copper proteins giving examples for each type.
26. What is biomineralisation ? Explain with a suitable example.
27. 'Selection of ATP as a carrier of phosphate group is quite unique.' Explain this statement in term of phosphate group transfer potential of ATP.

(6 × 6 = 36 marks)

Section D

Answer any two questions.

Each question carries 10 marks.

28. (a) Discuss the factors that affect the stability of metal complexes.
(b) What is trans effect? Outline any *one* of the theories to explain the trans effect.
(6 + 4 = 10 marks)
29. (a) How ionophores are classified? What are the distinguishing features between carrier and channel forming ionophores?
(b) Discuss the role of vanadium complexes as insulin mimetic agents in the treatment of diabetes.
(7 + 3 = 10 marks)
30. (a) Describe the structural features of haemoglobin and myoglobin. How do they differ in oxygen bonding activity?
(b) Write a note on the biological activity of ceruloplasmin.
(7 + 3 = 10 marks)
31. (a) Write a brief account of the photosynthetic process in plants bringing out the functions of PS I and PS II.
(b) Write a note on chelation theory.
(7 + 3 = 10 marks)

[2 × 10 = 20 Marks]