

**Parvatibai Chowgule College of Arts and Science**  
**Autonomous**

B.Sc. Semester End Examination, January 2022

Semester: III

Subject: Chemistry

Title: Bioinorganic Chemistry (Elective)

Duration: 2 Hours

Maximum Marks: 45

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**Instructions:** 1. All questions are compulsory.  
2. Figures to the right indicate full marks.

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**Q. 1. a) Answer ANY TWO of the following:**

- i) Living organisms do not employ the elements in the same order as that of their abundance in the earth's crust. Explain. (3)
- ii) Give the biological importance of lipids? (3)
- iii) How would you differentiate between secondary and tertiary protein structure? (3)

**b) Answer ANY ONE of the following:**

- i) Although hemoglobin is a tetramer, the subunits do not act independently. Explain the property involved and give reasons for this behaviour. (3)
- ii) Elucidate the role of transferrin in the iron transport process. (3)

**Q. 2. Answer ANY TWO of the following:**

- a) i) Using a suitable diagram, explain 'light reactions' in photosynthesis. (3)
- ii) Chelation therapy is used to treat iron overload. Explain with a suitable example. (3)
  
- b) i) Briefly outline the role of calcium in blood clotting. (3)
- ii) Explain in brief the complexes of mercury in medicine. (3)
  
- c) i) Using a suitable diagram explain the 'fluid mosaic model'. (3)
- ii) Illustrate with suitable examples the role of metal complexes for therapeutics. (3)

**Q. 3. Answer ANY TWO of the following:**

- a) i) Discuss the types of ferredoxins based on their structure. (3)
- ii) Using suitable diagram explain the structure and oxygen transport in hemocyanin. (3)
  
- b) i) What is Bohr effect? Explain using the O<sub>2</sub>-Hb dissociation curves. (3)
- ii) Give the comparison between haemoglobin and hemerythrin. (3)

- c) i) Illustrate the role of cytochromes in the electron transfer process. What is the significance of the stepwise electron transfer? (3)
- ii) What are siderophores? Briefly explain their function in biology. (3)

**Q. 4. Answer ANY ONE of the following:**

- a) i) The oxoferryl state is one of the important intermediates in the catalytic process. Illustrate the formation of oxoferryl in any one catalytic cycle. (5)
- ii) The activity of Zn(II) containing enzymes is not affected by substituting it with Co(II). Give reasons for this exchangeability. (4)
- iii) Give the comparison between nucleosides and nucleotides. (3)
- b) i) What is the role of the enzyme carbonic anhydrase? Give its reaction mechanism. (5)
- ii) Naturally occurring superoxide dismutase contains  $\text{Co}^{+2}$  and  $\text{Zn}^{+2}$ , however the apoenzyme is revived by adding Co(II) only. Justify the presence of Zn (II) in the natural system. (4)
- iii) The properties of water makes it well suited as the 'solvent of life'. Explain. (3)

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