

CH S 564: BIOINORGANIC CHEMISTRY

Course Outcome

- Students will learn metal and non-metal ions in biological systems and understand their role in biological systems.
- Gain knowledge on biological nitrogen fixation and photocatalysis.
- Explain the transport and storage of dioxygen, metal storage and transport.
- Demonstrate the role of metalloproteins as enzymes.
- Describe the therapeutic uses of metals, metal complexes as drugs and treatment of toxicity due to inorganics.

UNIT-I

[12 Hours]

Metal and non-metal ions in biological systems-essential and trace metals, deficiency of trace metal ions (Fe, Zn, Cu and Mn), ion transport across membranes, active transport of ions across biological membranes.

Iron-Sulfur proteins (rubredoxins and ferredoxins) and cytochromes including cytochrome P450.

Non-redox metalloenzymes: Structure and reactivity of carboxypeptidase-A, alcohol dehydrogenase, leucine aminopeptidase and carbonic anhydrase.

UNIT-II

[12 Hours]

Transport and storage of dioxygen, haemoglobin, myoglobin, hemerythrin and hemocyanins, heme proteins, oxygen uptake, functions of haemoglobin, myoglobin, hemerythrin and hemocyanins, synthetic oxygen carriers.

Metal storage and transport-Ferritin, transferrin and ceruloplasmin. Electron transfer proteins-cytochromes, iron-sulphur proteins. Metalloproteins as enzymes-Structure and reactivity of catalase, peroxidase, superoxide dismutase, copper oxidases.

Vitamin B₁₂ and Coenzymes: Structural feature, names of different forms, chemistry of cobalamin, biochemical functions of cobalamins, model compounds. Special characteristics of B₁₂ co-enzyme.

UNIT-III

[12 Hours]

Therapeutic uses of Metals: Metals in medicine-Metals and human biochemistry, general requirements. Disease due to metal deficiency and treatment: Iron, zinc, copper, sodium, potassium, magnesium, calcium and selenium.

Biochemistry of non-metals: Biomineralization, biological role of some trace nonmetals. Biological importance of Nitric oxide.

Biological nitrogen fixation, Molybdenum nitrogenase, Model compounds, *in vitro* fixation of nitrogen through dinitrogen complexes.

Metal complexes in transmission of energy-chlorophylls. Photosystems I and II in cleavage of water, model systems.

References

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