**MS/M.Phil/Ph.D**

Bio-inorganic chemistry

**Inorganic Chemistry**

**Contact Hours:** **Credit Hours:**

Theory =48 Theory = **3.0**

Practical = 00 Practical = 0.0

Total = 48 Total = **3.0**

**Code:**

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**Course Objectives**

The objectives of the course are:-

1. To impart in-depth knowledge about role of metal ions in biological systems.
2. To study the application of metals in macromolecules, heme containing proteins, enzymes.

**COURSE LEARNING OUTCOMES:**

Upon successful completion of the course, the student will be able to:

1. Understand the various roles of metal ions in biology including native metals and the use of metals as diagnostic and therapeutic agents.
2. Understand the relationship between metal ion properties and structural and functional roles.
3. Use of metals in diagnostic & treatment of diseases.

**Course outline:**

1. General principles of metallobiochemistry (at the interface of inorganic Chemistry and biochemistry), Composition of living organisms, role of metal ions in biological system.
2. Porphyrin rings, transport and storage of dioxygen, heme proteins, non heme, iron-sulfur clusters, transport and storage of iron, cobalamins, metals involved in photosynthesis, copper proteins in electron transfer and redox processes.
3. Enzymes, Proteins as ligands for metals. Nucleic acids and other metal-binding biomolecules,Control of metal concentration in the cell.
4. Metal clusters, Calcium in cell signalling, Zinc: Lewis acid and gene regulator.
5. DNA, RNA, nitrogen fixation, zinc proteins in Lewis acid/base catalysis and gene regulation, calcium as a second messenger and ubiquitous regulator.
6. Functions of alkali metals, biomineralization, biochemistry of toxic elements.
7. Physical methods used in bioinorganic Chemistry in detail.
8. Metals ions applications as therapeutic medicine & as diagnostic in detail.

**Teaching Methodology**

* Lecturing
* Written Assignments/ Presentations

**Assessment**

**Mid Term (40%)**

* Written (Long Questions, Short Questions, MCQs) 50%
* Presentation 20%
* Assignments 20%
* Quiz 10%

**Final Term (60%)**

* Written (Long Questions, Short Questions, MCQs) 50%
* Presentation 20%
* Assignments 20%
* Quiz 10%

**Text and Reference books:**

1. Principles of Bioinorganic Chemistry by S. J. Lippard & J. M. Berg, University Science Books, 1994.
2. Bioinorganic Chemistry - A Survey by E. Ochiai, Academic Press, 2008.
3. Biocoordination Chemistry by D. E. Fenton, Oxford University Press, 1995.
4. Astrid Sigel, Helmut Sigel and Roland K.O. Sigel, ed. (2008).Biomineralization**:** From Nature to Application. Metal Ions in Life Sciences. 4. Wiley.
5. [Greenwood, Norman *N.*](https://en.wikipedia.org/wiki/Norman_Greenwood); Earnshaw, Alan (1997). Chemistry of the Elements (2nd ed.) [Butterworth-Heinemann](https://en.wikipedia.org/wiki/Butterworth-Heinemann).
6. Heinz-Bernhard Kraatz, Nils Metzler-Nolte, *Concepts and Models in Bioinorganic Chemistry*, John Wiley and Sons, 2006.
7. Lawrence Que, Jr., ed., *Physical Methods in Bioinorganic Chemistry*, University Science Books, 2000.
8. Gray, Stiefel, Valentine & Bertini, “Biological Inorganic Chemistry: Structure and Reactivity”, University Science Books, 2006.