

Theory:

1. Lee, J.D.; (2010), **Concise Inorganic Chemistry**, Wiley India.
2. Huheey, J.E.; Keiter, E.A.; Keiter; R. L.; Medhi, O.K. (2009), **Inorganic Chemistry- Principles of Structure and Reactivity**, Pearson Education.
3. Douglas, B.E.; McDaniel, D.H.; Alexander, J.J. (1994), **Concepts and Models of Inorganic Chemistry**, John Wiley & Sons.
4. Atkins, P.W.; Overton, T.L.; Rourke, J.P.; Weller, M.T.; Armstrong, F.A. (2010), **Shriver and Atkins Inorganic Chemistry**, 5th Edition, Oxford University Press.

Practicals:

- Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), **Vogel's Textbook of Quantitative Chemical Analysis**, John Wiley and Sons.

Additional Resources:

1. Wulfsberg, G (2002), **Inorganic Chemistry**, Viva Books Private Limited.
2. Miessler, G.L.; Fischer P.J.; Tarr, D. A. (2014), **Inorganic Chemistry**, 5th Edition, Pearson.

GE 3: Chemistry: Bioinorganic Chemistry**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Bioinorganic Chemistry (GE-3)	4	2		2		Basic knowledge of Chemistry

Learning Objectives

The Learning Objectives of this course are as follows:

- To introduce students to bioinorganic chemistry, currently a frontier area of chemistry providing an interface between organic chemistry, inorganic chemistry and biology.
- To make students learn about the importance of inorganic chemical species, especially metals, in biological systems, through discussions on topics such as the sodium-potassium pump, the applications of iron in physiology, including iron transport and storage system, role of magnesium in energy production and chlorophyll, toxicity of heavy metal ions and their antidotes.

Learning Outcomes

By the end of the course, the students will be able to:

- Classify metal ions in biological systems as essential, non-essential, trace & toxic.
- Diagrammatically explain the working of the sodium-potassium pump in organisms and the factors affecting it
- Understand the role of metal ions such as Mg, Ca and Fe in biological systems.
- Understand the toxicity of heavy metal ions (Hg, Pb, Cd and As) in the physiological system
- Explain the use of chelating agents in medicine

SYLLABUS OF GE-3

Theory:

Unit 1: Introduction **(6 Hours)**

A brief introduction to bio-inorganic chemistry. Metal ions present in biological systems and their classification on the basis of action (essential, non-essential, trace & toxic). Classification of metallobiomolecules (enzymes, transport and storage proteins and non-proteins). Brief idea about membrane transport, channels, pumps.

Unit 2:Role of s-block Elements in Biological System **(8 Hours)**

Role of metal ions present in biological systems with special reference to Na^+ , K^+ and Mg^{2+} and Ca^{2+} ions: Na/K pump; Ca pump, role of Mg^{2+} ions in energy production and chlorophyll. Role of calcium in bone formation.

Unit 3:Role of iron in Biological System **(8 Hours)**

Role of iron in oxygen transport and storage (haemoglobin and myoglobin), Perutz mechanism, Cooperative effect, Bohr effect, comparison of oxygen saturation curves of haemoglobin and myoglobin, carbon monoxide. Storage and transport of iron in humans (ferritin and transferrin).

Unit 4: Toxicity of Heavy Metal Ions **(8 Hours)**

Toxicity of heavy metal ions (Hg, Pb, Cd and As), reasons for toxicity and their antidotes

Practicals: **(60 Hours)**

WEEKS

(Laboratory Periods: 60)

1. Spectrophotometric estimation:

- Verify Lambert-Beer's law and determine the concentration of $\text{CuSO}_4/\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7/\text{CoSO}_4$ in a solution of unknown concentration
- Spectrophotometric estimation of Fe^{2+} ions by using 1, 10- phenanthroline

(iii) Determination of the composition of the Fe^{3+} - salicylic acid complex in solution by Job's method.

2. Complexometric titrations using disodium salt of EDTA:

- (i) Estimation of Zn^{2+} using EBT / Xylenol orange as indicator
- (ii) Estimation of Mg^{2+}
- (iii) Estimation of Ca^{2+} by substitution method
- (iv) To estimate the concentration of Ca in commercially available medicines.
- (v) To estimate the Mg present in multivitamins.

References:

Theory:

1. Huheey, J.E.; Keiter, E.A., Keiter; R. L.; Medhi, O.K. (2009), **Inorganic Chemistry- Principles of Structure and Reactivity**, Pearson Education.
2. Shriver, D.D.; Atkins, P.; Langford, C.H. (1994), **Inorganic Chemistry** 2nd Ed., Oxford University Press.
3. Cotton, F.A.; Wilkinson, G.; Gaus, P.L. **Basic Inorganic Chemistry**, 3rd Edition, Wiley India.
4. Crichton, R.R. (2008), **Biological Inorganic Chemistry: An Introduction**. Amsterdam, Elsevier.
5. Kaim, W., B. Schwederski and A. Klein. (2014), **Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life: An Introduction and Guide**. 2nd Edition, Wiley.

Practical:

1. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), **Vogel's Textbook of Quantitative Chemical Analysis**, John Wiley and Sons.

Additional Resources:

1. Lippard, S.J.; Berg, J.M. (1994), **Principles of Bioinorganic Chemistry**, Panima Publishing Company.
2. Greenwood, N.N.; Earnshaw, A. (1997), **Chemistry of the Elements**, 2nd Edition, Elsevier

GE 4: Chemistry: Basic Concepts of Organic Chemistry

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/Practice		
Basic Concepts of Organic Chemistry (GE-4)	4	2		2		