



M. Sc.(Inorganic Chemistry)
Semester – IV

Course Code	PS04CINC23	Title of the Course	Bioinorganic Chemistry
Total Credits of the Course	4	Hours per Week	4

Main Focus of the Course outcomes	Employability	Skill Development	Entrepreneurship
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Course Objectives:	<ol style="list-style-type: none"> 1. The students identify the elements important in living systems and their biological roles. 2. The students explain the mechanism of carbonic anhydrase and carboxy peptidases. 3. The students explain the electron transfer processes in biological systems. 4. The students know the important role of metals in medicine. 5. The students study the chelation therapy for detoxification, Drugs for neurological disorders, arthritis antibiotics and MRI agents. 6. The students learn the metal- nucleic acid interactions, application of fluorescence quenching in drug-DNA binding studies and structure activity relationship, mechanism of action, aspects of Pt binding to DNA. 7. The students learn nonplatinum antitumor metal complexes.
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Course Content		
Unit	Description	Weightage* (%)
1.	Bioinorganic Chemistry-I The elements of living system: The biological roles of metal ions, Calcium biochemistry, Iron biochemistry, Nonmetals biochemistry Enzymes exploiting acid catalysis: Carbonic anhydrase, Carboxy peptidases.	25%
2.	Bioinorganic Chemistry-II Redox catalysis: Iron sulphur proteins and non-heme iron, Cytochromes of the electron transport chain, Cytochrome P-450 enzymes, Coenzyme B12, Blue copper proteins Metals in medicine: Antibiotic and related compounds, Chelate therapy, Inhibition and poisoning, Metal complexes as probes of nucleic acids	25%
3.	Metal ions and complexes in Medicine – I Metal deficiency and diseases, chelation therapy for metal ion detoxification, Lithium drugs in neurological disorders, gold antiarthritis drugs, pharmacology of auranofin, Role of metal ions in	25%





	the action of antibiotics, Metal ions in clinical diagnosis: MRI agents Radiopharmaceuticals: Use of Tc, Re, Sm, Sr, Ga, Co, and I isotopes	
4.	Metal ions and complexes in Medicine – II Metal- nucleic acid interactions: Coordination, Non-covalent interactions - intercalation and hydrogen bonding, hydrophobic interactions, DNA strand cleavage, Biological fluorophores, Application of fluorescence quenching in drug-DNA binding studies. DNA binding and mechanistic possibility, Platinum anticancer drugs, structure activity relationship, mechanism of action, aspects of Pt binding to DNA – kinetics, crosslinking, physical effects and biological consequences, Nonplatinum antitumor metal complexes: Ru(III) ammine complexes, Antitumor activity, structure activity relationship, DNA binding and cleavage Anticancer activity of metallocenes, Structure and chemical properties of streptonigrin and its metal complexes, evidence for formation of ternary complexes involving DNA, antitumor activity and mechanism	25%

Teaching-Learning Methodology	Class room teaching, seminars, quizzes, and assignments
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Know the elements important in living systems and their biological roles.
2.	Explain the mechanism of carbonic anhydrase and carboxy peptidases.
3.	Explain the electron transfer processes in biological systems.
4.	Acquire the knowledge of important role of metals in medicine.
5.	Know chelation therapy for detoxification, Drugs for neurological disorders, arthritis antibiotics and MRI agents.





6.	Learn the metal- nucleic acid interactions.
7.	Apply fluorescence quenching in drug-DNA binding studies.
8.	Learn the structure activity relationship, mechanism of action, aspects of Pt binding to DNA.
9.	Know about nonplatinum antitumor metal complexes.

Suggested References:

Sr. No.	References
1.	Elements of Bioinorganic Chemistry, G.N. Mukherjee and Arabinda Das
2.	Bioinorganic Chemistry, G. R. Chatwal and A. K. Bhagi
3.	Principles of Bioinorganic Chemistry, S.J. Lippard and J. M. Bersa
4.	Bioinorganic Chemistry, Bertini, H. B. Gray and S. J. Lippard
5.	Inorganic Chemistry, Shriver and Atkins
6.	Inorganic Chemistry, James E. huheey, Ellen A. Keiter and Richard L. Keiter
7.	Bio-inorganic Chemistry, R.W. Hay – R.W. Hay, Ellis Horwood Limited Publishers chichester 1984
8.	Metal ions in Biological Systems Ed by H. Sigel Vol I to XIX, Marcel Dekker, Basel
9.	Principles of Bio Inorganic Chemistry, S. J. Lippard and J. M. Berg, University Science Books 199.
10.	Facets of coordination chemistry Ed by B.V. Agarwal & K.N. Munshi, World Scientific, Singapore, NJ, London.
11.	Bioinorganic Chemistry, Bertini, Gray, Lippard, & Valentine Viva books pvt ltd (1998)
12.	Bioinorganic Chemistry an introduction, J.A. Cowan, Wiley-VCH

On-line resources to be used if available as reference material

On-line Resources





SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25))
Syllabus with effect from the Academic Year 2018-19

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