Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2021-2022

Course Handout (Part - II)

Date: 18.08.2021

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : CHEM G552
Course Title : Advanced Inorganic Chemistry
Instructor-in-charge : Prof. R. Krishnan
Instructor : Dr. Himanshu Aggarwal and Prof. R. Krishnan

Course Description : Advanced coordination chemistry, reactions, kinetics and mechanism; advanced organometalic chemistry, bonding models in inorganic chemistry, inorganic chains, rings, cages and clusters; group theory and its applications to crystal field theory, molecular orbital theory and spectroscopy (electronic and vibrational); inorganic chemistry in biological systems.

1. **Scope and Objective of the Course:** Theories of coordination chemistry, electronic spectroscopy and magnetism of complexes, organometallic chemistry. Bioinorganic, medicinal and environmental inorganic chemistry.

2. **Text Book:** T1. " Inorganic Chemistry" Huheey J. E., Keiter, Ellen A., Keiter, Richard L., Medhi, O.K.; 4th ed., Pearson.
   T2. . I. Bertini, H. B. Gray, S. J. Lippard, J. S. Valentine, "Bioinorganic Chemistry", Viva, 1998.
   Reference Books: R1. "Concise Inorganic Chemistry", Lee, J.D. 5th Edition,Wiley, India Edition.
   R2 "Inorganic Chemistry", Shriver, D.F.; Atkins, P.W.; Overton T. L., Rourke, J. P., Weller, M. T., Armstrong, F. A. 4th edition, Oxford.
   R3 "Concepts & Models of Inorganic Chemistry" B. Douglas, D. McDaniel and J. Alexander 3rd Edn , wiley India.
   R4. E. Ochiai, "Bioinorganic Chemistry: A Survey", Academic Press, 2008.

3. **Course Plan:**

Lecture No.	Learning Objectives	Topics to be covered	Chapter in the Text Book
1-2	Coordination chemistry	Bonding VB theory applied to coordination compounds	**T1**: 12.1-12.7
3-6	Crystal Field Theory (CFT)	Crystal field splitting; d orbitals in	T1:Chapter 14: 428-444

		different crystal fields; applications of CFT	
7-8	Structure Nomenclature	Structure – Nomenclature, Coordination numbers 1, 2, 3, 4, 5, 6, 7. Generalization about coordination numbers Isomerism: Linkage and other types of isomerism Chelate effect	T1:Chapter 15: 461-492
9	Molecular orbital theory	Molecular orbital theory	T1:Chapter 14: 444-459
10-12	Electronic spectra of complexes, Magnetic properties of complexes	Electronic spectra of complexes, Magnetic properties of complexes	T1:Chapter 15: 461-492
13-15	Reactions of coordinated complexes	Reactions – Nucleophilic substitution reactions, Kinetics, Mechanisms	T1:Chapter 17 (542-569) and Lecture notes
16-20	Organometallic chemistry	The 18-electron rule Metal-carbonyl complexes Nitrosyl complexes Dinitrogens Alkyls Carbenes, Carbynes, Carbides Alkenes Alkynes Metallocenes Catalysis by organometallic compounds Stereo chemically non-rigid molecules	T1:Chapter 18 and Lecture notes
21	Bioinorganic chemistry	Introduction to Bioinorganic Chemistry	T2
22-24	Metal ion storage	Metal ion storage, transport and biomineralization	T2(Ch 1)
25-27	Oxygen carriers	Oxygen carriers: Iron and copper in biological systems	T2(Ch 4)
28-29	Oxygenases	Oxygenation reaction: iron and copper	T2(Ch 5)
30-32	Electron transfer	Electron transfer and redox processes in biological systems	T2(Ch 6)

33-34	Metal-sulfur proteins	Metal-sulfur proteins and metalloenzymes	T2(Ch 7)
35	Photosynthesis	Photosynthesis and artificial photosynthetic models	T2(Ch 7)
36	Vitamin B_{12}	Cobalt in biological systems	T2(Ch 2)
37-38	Metal in medicine	Medicinal inorganic chemistry	T2(Ch 9)
39	Metal-Nucleic acid	Metal-Nucleic acid interactions	T2(Ch 8)
40-41	Environmental inorganic chemistry	Toxicity of metal ions and environmental bioinorganic chemistry	R4

4. Evaluation Scheme:

Component	Duration	Weighting (%)	Date and Time	Nature of Component
Class tests, Assignments and presentations	-	40	Continuous	Open Book
Mid Semester Test	90 min	28	--/--/2021	Closed Book
Comprehensive Examination*	120 min	32	--/--/2021	Closed Book

5. Chamber Consultation Hours: To be announced in the class.

6. Notices: Notices, if any, concerning the course will be displayed on the Chemistry Department Notice Board as well as in CMS.

7. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

8. Make-up-policy: No make up for the assignments/class tests. May be granted only for genuine cases.

Instructor-in-charge