Name of the Programme: M. Sc -I (Inorganic Chemistry)

Course Code: CHI-504 **Title of the course:** Concepts in Inorganic Chemistry

Number of Credits: 04

Effective from AY: 2022-23

Prerequisites for the course:	Students should have studied Inorganic chemistry courses at M.Sc. Chemistry in semester I	
Course Objective:	1. To gain knowledge in selected topics in inorganic chemistry and study the applications of inorganic compounds in selected areas. 2. To learn in details about the s-block elements and their compounds. 3. To understand the concepts in acid-base reactions in the Inorganic chemistry. 4. To gain knowledge about atomic stability and nuclear reactions. 5. To study the importance of metal ions in the field of medicinal chemistry.	
Content	**1. s-Block elements and their compounds** a. Hydrogen and hydrides; Electronic structure, position in periodic table, abundance, preparation, properties, isotopes, ortho and para hydrogen. Classification of hydrides, preparation & properties of hydrides; hydrogen ion, hydrogen bonding and its influence on properties. b. Group 1 elements; Introduction, abundance, extraction, physical and chemical properties, solubility and hydration, solutions of metal in liquid ammonia, complexes, crowns and cryptands, electrides, alkalides, difference between lithium and the other group 1 elements, diagonal relationship between Li and Mg. c. Group 2 elements; Introduction, abundance, extraction, physical and chemical properties, solutions of metal in liquid ammonia, complexes, anomalous behaviour of beryllium, difference between beryllium and the other group 2 elements, diagonal relationship between Be and Al, preparation and properties of Grignard reagent.	No of hours 17
	2. Inorganic medicinal chemistry a. Anticancer agents; Platinum and Ruthenium complexes as anticancer drugs, Cancerchemotherapy, phototherapy, radiotherapy using borane compounds. b. Chelation therapy. c. Gadolinium and technetium complexes as MRI contrast agents, X-ray contrast agents. d. Anti-arthritis drugs. e. Anti-bacterial agents (Ag, Hg, Zn and boron compounds). f. Antiseptic and anti-biotic. g. Deodorants and anti-perspirants.	16

	3. Chemistry of radioactive elements a. Atomic nucleus; Classification of nuclides and nuclear stability. b. Review of Nuclear models. c. Radioactivity, Decay processes and decay energy, half-life of radioactive elements. d. Nuclear reactions; Nuclear fission and fusion processes. e. Nuclear Reactors; Nuclear reactor components and functions, Q values for nuclear reactions. f. Detection and measurement of activity; Radiation detection principles. g. Physical and Chemical separation techniques of radioactive elements. h. Radio-analytical techniques, Activation analysis. i. Nuclear waste management. j. Applications of radioactivity.	15
	4. Acids and Bases a. Brønsted acidity; Proton transfer equilibria in water, Solvent levelling, The solvent system definition of acids and bases, Characteristics of Brønsted acids, Periodic trends in aqua acid strength, Simple oxoacids, Anhydrous oxides, Polyoxo compound formation, Nonaqueous solvents. b. Lewis acidity; Examples of Lewis acids and bases, Group characteristics of Lewis acids. c. Reactions and properties of Lewis acids and bases; The fundamental types of reaction, Hard and soft acids and bases, Thermodynamic acidity parameters, Solvents as acids and bases. d. Applications of acid–base chemistry, Superacids and superbases, Heterogeneous acid–base reactions.	12
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.	
References / Readings	1. P. W. Atkins, T. Overton, J. Rourke, M. Weller, F. Armstrong, Shriver & Atkins Inorganic Chemistry, 5th Ed.;Oxford Publications, 2009. 2. J. E. Huheey, E. A. Kieter, R. L. Kieter, O. K. Medhi, Inorganic Chemistry: Principles of Structure & Reactivity, 4th Ed.;Pearson, 2011. 3. F. A. Cotton, G. Wilkinson, P. L. Gauss, Basic Inorganic Chemistry, 3rd Ed.;Wiley, 2008. 4. J. D. Lee, Concise Inorganic Chemistry, 5thEd.;Wiley, 2008. 5. F. A. Cotton, G. Wilkinson, Advanced Inorganic Chemistry, 3rd Ed.; Wiley, 1984.	

	6. N. N. Greenwood, A. Earnshaw, Chemistry of the Elements, Pergamon Press, 1st Ed.; 1984. 7. A. G. Sykes, Advances in Inorganic Chemistry, UK Ed.;Academic Press Ltd., 1991. 8. H. J. Arnikar, Essentials of Nuclear Chemistry, 4th Revised Ed.; New Age Intl.Publishers, 2011. 9. G. Friedlander, J. W. Kennedy, E. S. Macias, J. M. Miller, Nuclear & Radiochemistry, 3rd Ed.; John Willey & Sons, 1981. 10. K.A. Strohfeldt, Essentials of Inorganic Chemistry, Ist Ed.; John Willey & Sons, 2015. 11. G.R. Choppin, J-O. Linjenzin, Radiochemistry and Nuclear Chemistry, 2nd Ed.; Butterworth-Heinemann Ltd, 1995. 12. R. S. Drago, Physical Methods in Inorganic Chemistry, Affiliated East West Press Pvt. Ltd., 2017 13. G. C. Miessler, D. A. Tarr, Inorganic Chemistry, 3rd Ed.; Pearson, 2004
Course outcomes:	1. Students will be able to explain the chemistry of s-block elements. 2. Students will be able to explain fundamentals of inorganic medicinal chemistry. 3. Students will be able to solve numerical problems related to some concepts in acid-base and nuclear chemistry. 4. Students will be able to analyse reactions and processes in field of nuclear chemistry.