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

Course Code: CHI-600 **Title of the course:** Practical Course in Inorganic Chemistry-III

Number of Credits: 4

Effective from AY: 2023-24

Prerequisites for the course:	Should have studied Inorganic chemistry practical course at M.Sc. Part-I.	
Course Objective:	1. To introduce practical knowledge in Inorganic Chemistry. 2. To learn techniques of crystallization and synthesis of coordination compounds. 3. To learn characterization of compounds using different instruments. 4. To provide experience of synthesis and characterization of materials. 5. To introduce analysis of ores for metal content.	
Content	*Minimum 23 experiments from the entire list shall be conducted* **Unit – 1 Experiments in coordination chemistry: complex synthesis, metal analysis (Any Five)** a. Purification (distillation/recrystallisation) of ligands like acacH, en, carboxylic acids etc. b. Preparation of manganic tris(acetylacetonate) and estimation of manganese. c. Preparation of tris(thiourea)copper(I) sulfate and estimation of copper. d. Preparation of isomers; cis and trans-dichloro(ethylenediamine)cobalt(III) chloride and estimation of cobalt. e. Preparation and resolution of tris(ethylenediamine)cobalt(III) ion and estimation of cobalt. f. Preparation of cis and trans-potassium dioxalatodiaquochromate(III) and estimation of chromium. g. Preparation of nitro and nitrito-pentaaminecobalt(III) chlorides and estimation of cobalt. h. Preparation cobalt(III) porphyrin complex and estimation of cobalt. i. IR spectral characterization of free ligands and coordinated ligands. *NOTE: In complex synthesis, the student is expected to recrystallise the product, record IR spectra and carry out metal analysis. Spectral analysis can be carried over.*	No of hours 30
	Unit –2 Experiments in Solid state chemistry (Any Eight) a. Preparation of spinel oxides by precursor method.	36

	b. Estimation of metals in precursors and oxides. c. Characterization of precursors by thermal analysis. d. Characterization of precursors and oxides by infrared analysis. e. X-ray diffraction studies of metal oxides. f. Direct current electrical resistivity of semiconductor (Ge/Si) by Four Probe method. g. Curie temperature determination of dielectric material (PZT) by measurement of dielectric constant v/s temperature. h. Measurement of saturation magnetization, Ms, Mr and Hc of ferromagnetic materials. i. Determination of Curie temperature of magnetic oxides by A.C. susceptibility studies. j. Preparation of CuO/SiO_2 or NiO/SiO_2 by wet impregnation method.	
	Unit – 3 Instrumental methods / spectral analysis / ion exchange (Any Six) a. Determination of stability constant of Fe(III) – salicylic acid compound (Job's Method). b. Determination of stability constant of Fe(III) – thiocyanate compound. c. Determination of stability constant of Fe(II) – 1,10-phenanthroline compound. d. Determination of instability constant for the reaction between Ag^+ and NH_3. e. Determination of instability constant for the reaction between Ag^+ and en. f. Determination of instability constant for the reaction between Cu^{2+} and NH_3. g. Determination of instability constant for the reaction between Cu^{2+} and en. h. Ion exchange chromatography: Separation of Mg^{2+} and Co^{2+} by anion exchange column. Separation of transition metal cations by anion exchange column.	30
	Unit – 4 Ore / Alloy / commercial sample separation and analysis using Titrimetry / Gravimetry / spectroscopy method (Any Four) a. Analysis of Goan Iron ore: Hematite / magnetite b. Analysis of Devardas alloy c. Analysis of solder (Pb and Sn) d. Analysis of Pyrolusite e. Analysis of Nickel-Aluminium alloy f. Analysis of Brass alloy g. Analysis of Bauxite	24

	h. Analysis of Magnesite	
Pedagogy	Students will be given pre-lab and post-lab assignments on theoretical aspects of laboratory experiments prior to the conduct of each experiment.	
References / Readings	1. G. Brauer, Handbook of Preparative Inorganic Chemistry, Vol. 1 & 2, 1963. 2. G. Pass & H. Sutcliffe, Practical Inorganic Chemistry, Preparations, Reactions and Instrumental Methods, 2nd Ed.; Chapman & Hall, 1974. 3. S. De Meo, J. Chem. Ed., Vol 80, Pg.No.796-798, 2003. 4. W. L. Jolly, The Synthesis & Characterization of Inorganic Compounds, Prentice-Hall, INC, 1970. 5. A. J. Elias, General Chemistry Experiments, Revised Ed.; University Press, 2008. 6. J. Mendham, R.C. Denney, J.D. Barnes, M.J. K. Thomas, Vogel's Text Book of Quantitative Chemical Analysis, 6th Ed.; Pearson, 2002. 7. G. Svehla, Vogel's Text Book of Qualitative Inorganic Analysis, 7th Ed.; Pearson, 2011. 8. G. Marr, B. W. Rockett, Practical Inorganic Chemistry, Van Nostrnad Reinhold London, 1972.	
Course Outcome:	1. Students will be in a position to purify ligands and will apply knowledge to synthesize coordination compounds. 2. Students will be able to study properties of coordination compounds using different instruments. 3. Students will apply knowledge to synthesize solid state material and can study their properties. 4. Students will be in position to separate metal ions by ion exchange chromatography. 5. Students apply knowledge to separate and analyze metals present in ores and alloys.	