

CHE-306-MJP: INORGANIC CHEMISTRY PRACTICAL I

Course Type: Major Practical

Credits: 2

A. Course Objectives:

1. To provide training in gravimetric analysis and inorganic estimations.
2. To familiarize students with preparation of inorganic complexes and compounds.
3. To develop understanding of qualitative analysis and identification of ions.
4. To introduce analytical methods used in pharmaceutical and industrial samples.
5. To inculcate skills in laboratory techniques, safety, and scientific reporting.

B. Course Outcomes (COs):

CO No.	Course Outcome Statement (COs) <i>After learning the course, the students are able to -</i>
CO-1	Recall principles of gravimetric estimation, inorganic preparations, and qualitative analysis.
CO-2	Explain experimental procedures and chemical reactions involved in analysis and synthesis.
CO-3	Apply techniques for estimation, preparation, and identification of inorganic compounds.
CO-4	Analyze experimental data and observations from gravimetric and qualitative methods.
CO-5	Evaluate accuracy, errors, and results of analytical experiments.
CO-6	Prepare systematic laboratory reports and industrial visit documentation.

C. Contents:

Prerequisites

Students should have basic knowledge of inorganic chemistry, chemical reactions, and stoichiometry. Familiarity with laboratory practices, handling of glassware, and safety procedures is required.

A minimum of 12 experiments are to be completed.

A. Gravimetric Estimations (Any 3)

1. Estimation of Fe as Fe_2O_3 . [Ref-1: Page 457]
2. Estimation of Calcium as Calcium Oxalate.
3. Estimation of Barium as Barium chromate.
4. Estimation of Mg as Oxinate.

5. Estimation of Lead as Lead Chromate.
6. Estimation of Ba as BaSO₄ using homogeneous precipitation method. [Ref-1: Page 448]
7. Estimation of Nickel as Ni – DMG. [Ref-1: Page 462]
8. Analysis of sodium bicarbonate from mixture by thermal decomposition method.[Ref.-6]
9. Determination of water of crystallization by thermal decomposition. [Ref.-5]
10. Analysis of Food/Pharmaceutical sample for ash and sulphated ash: Aspirin. [Ref. -2]

B. Inorganic Preparations (Any 3) (Ref-7, 8, 9)

Preparation of following inorganic complexes and spot tests for metal ions and ligands:

1. Preparation of Tris(acetylacetonato)iron(III) : [Fe(acac)₃]
2. Preparation of Hexaminecobalt(III) chloride : [Co(NH₃)₆]Cl₃
3. Preparation of Sodium Hexanitritocobaltate(III) : Na₃[Co(NO₂)₆]
4. Preparation of Potassium trioxalatoferrate(III) : K₃[Fe(C₂O₄)₃]
5. Preparation of Tris(acetylacetonato)manganese(III) : [Mn(acac)₃]
6. Preparation of Tris(glycinato)nickelate(II) : [Ni(gly)₃]⁻
7. Preparation of Potassium dioxalatocuprate(II): : [Cu(C₂O₄)₂]²⁻
8. Preparation of Prussian Blue : KFe[Fe(CN)₆]

C. Inorganic Qualitative Analysis (6 Experiments)

1. Inorganic Qualitative analysis (5 mixtures)

[1 simple water soluble mixture, 2 mixtures containing borates and 2 mixtures containing phosphates] (*Procedure from DST Manual 'Green Chemistry' Monograph must be followed strictly*) [Ref.-4]

2. Limit test for iron, chloride and sulphate from pharmaceutical raw materials.[Ref.-2; pp – 220]

OR

2. Qualitative and confirmatory tests of inorganic toxicants of any four ions (Borate, copper, hypochlorite or nitrate or nitrite, Sb or Bi, Iodate, H₂O₂). [Ref.-3]

D. Industrial Visit:

Visit to any one of the Chemical / Pharmaceutical / Polymer / Research Institutes / Sugar Factories / waste water treatment plant, etc. is essential and a systematic report is to be submitted by the student to the Department of Chemistry.

References:

1. Vogel's Textbook of Inorganic Quantitative Analysis, G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, Longman Scientific & Technical, 5th Edition, 1989.
2. Indian Pharmacopoeia, Government of India, Vol. 2, 2007.
3. Basic Analytical Toxicology, World Health Organization, Edition not specified.
4. Green Chemistry Monograph, Department of Science & Technology (DST), Government of India, Edition not specified.
5. The Gravimetric Analysis of Barium Chloride Hydrate, Online Resource, <https://www.studocu.com/ec/document/universidad-de-investigacion-de-tecnologia-experimental-yachay/fisica-matematica/otros/the-gravimetric-analysis-of-barium-chloride-hydrate/8364963/view>
6. Experimental Inorganic Chemistry, Mounir A. Malati, Horwood Publishing, 1999.
7. Experiments in Chemistry, D. V. Jahagirdar, Himalaya Publishing House, Edition not specified.
8. Synthesis of Cis-[Cu(gly)₂], Trans-[Cu(gly)₂] and Cis-[Ni(gly)₂]·H₂O, Journal of Chemical Education, ACS Publications, 97(3), 2020, 801–805.