Course ID. PGCHM17E410 Title: Advanced Lab. Course in Inorganic Chemistry
Max. Marks: 100 **Duration: 64 Contact hours**
External Exam: 80 Marks **Internal Assessment: 20 Marks**

A: - Inorganic Preparations:

1. Preparation of tetraamminecarbonatocobalt(III)nitrate and its conversion to pentaamminecholorocobalt (III) chloride.
2. Preparation of trans dicholoro bis (ethylenediamine) cobalt (III) chloride and its conversion to cis-isomer.
3. Preparation of tris (ethylenediamine) nickel (II) chloride dihydrate and its conversion to bis (ethylenediamine) nickel (II) chloride.
4. Preparation of bis (acetylacetonato) copper (II) dihydrate.
5. Preparation of pentaamminecholorocobalt (III) chloride and study of Linkage isomers by its conversion to pentaamminenitritocobalt (III) chloride and to nitro isomer followed by IR Characterization.

B Separation by Column Chromatography and Estimations:

1. Separation of Permanganate and dichromate ions on Alumina column and their Estimation from Beer Law plots.
2. Determination of ionisable chloride in a Complex by cation exchange column (separation followed by Mohr's titration of elute for estimation).
3. Separation of Cobalt (II) and Nickel (II) on anion exchange column followed by estimation through EDTA titrations.
4. Separation of two Cobalt (III) complexes viz $[Co(NH_3)_6]Cl_3$ and $[Co\ (NH_3)_5Cl]Cl_2$ on Silica column.
5. Ion exchange separation of Hydration / ionization isomers of Chromium (III) Chloride ($CrCl_3$).

C Potentiometric Titrations: (6 Experiments)

1. Standardization of an Iron (ii) solution with a standard dichromate solution over Pt & Calomel assembly.
2. Determination of purity of Ce (IV) Sulphate with a standard Iron (II) solution over Pt & Calomel assembly.
3. Estimation of Iodide with Standard $AgNO_3$ over Pt & Calomel assembly using $\frac{I^-}{I_2}$ redox couple.
4. Simultaneous determinations of Chloride and Iodide ions with Standard $AgNO_3$ over Ag-Glass electrode assembly.
5. Determination of the purity of $[Co\ (NH_3)_5Cl]Cl_2$ over Ag-Glass electrode assembly.
6. Complexometric titration for determination of Ferro cyanide with standard Zinc (II) solution and in order to establish the composition of the complex $K_2Zn_3[Fe(CN)_6]_2$

D pH-metric Titrations: (2 Experiments)

1. Quantitative analysis of Chromate Dichromate mixture by pH Titration.
2. Purity of Acetyl Salicylic acid (Asprin) in a commercial tablet by pH Titration.

E: Conductometric Titrations: (2 Experiments)

1. To determine the solubility and solubility product of a sparingly soluble salt ($BaSO_4$) in water.
2. To determine the composition of mixture of two strong acids by Conductometric method.

F: Spectrophotometry: (6 Experiments)

1. Determination of Iron (II) with 1,10-Phenanthroline.
2. Determination of Phosphate by Molybdenum blue method.
3. Determination of formula of Iron (III) thiocyanate complex by Job's Continuous variation method.
4. Determination of composition of Iron (II)—2,2-bipyridyl complex by Mole ratio method.
5. Spectrophotometric determination of inorganic phosphorus in human serum.
6. Determination of rate of Aquation of complex $[Co(NH_3)_5Cl]Cl_2$ in acidic medium.

Books Recommended:

1. Modern Analytical Chemistry; D. Harvey; McGraw-Hill Higher Education; 2000
2. Chromatography: Basic Principles, Sample Preparations and Related Methods; 1st edn; Wiley-VCH; 2013
3. Vogel's quantitative analysis; 6th edn.J. Mendham, R.C.Denny;J. D. Barnes; M.J. Kthomas; Pearson Education; 2002
4. Analytical chemistry; 6th edn.; G. D. Christian; John Wiley; 2003
5. Principles and Practice of Analytical Chemistry; 5th edn.; F. W. Fifield; D. Kealey; Balckwell Sciences; 2000.
6. Chromatographic methods; 5th edn.; A. Braithwaite; F.J. Smith; Kluwer Academic Publishers; 1999
7. Essence of Chromatography; 1st edn.; C. F. Poole; Elsevier; 2003
8. Synthesis and Technique in Inorganic chemistry; 3rd edn; G. S. Girlomi; R. J. Angleci; University Science Books; 1999
9. Synthesis and characterization of Inorganic compounds; W. A Jolly; Prentice-Hall; 1970
10. Inorganic syntheses; Vols II, VI; Academic Press.
11. Experimental Inorganic / Physical Chemistry ; M. A. Malati; Horwood;1999.
12. Quantitative Chemical Analysis ; 5th edn.; Harris ; Freeman ; 1999.
13. Advanced Practical Inorganic Chemistry ; Adams ; Raynor, Wiley ; 1995.
14. Advanced Experimental Inorganic Chemistry ; Ayodha Singh ; Campus Books 2002.