



Master of Science, Chemistry
M. Sc. Chemistry, Semester – I

Course Code	PS01CCHE54 & PS01CCHE55	Title of the Course	Practicals
Total Credits of the Course	08 (04 for each course)	Hours per Week	16

Course Objectives:	<ul style="list-style-type: none">• Describe how to design experiments, execute experiments, and investigate and infer the observations yielded.• The students are trained to handle the experimental set up including standardization.• Synthesis and quantitative analysis of organic and inorganic compounds.• Identification and separation of radicals present in inorganic mixture.• Estimation of organic functional group/molecules by titrimetric methods.
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Course Content	
Sr. No.	Description
	<u>Physical Chemistry</u>
1.	To determine the heat of solution of the given acid by solubility method
2.	Determination of hydrolysis constant of aniline hydrochloride by distribution method
3.	Determination of the critical solution temperature (CST) of the phenol/water system and to study the effect of additive on CST
4.	To determine the surface tension of methyl acetate, ethyl acetate, hexane and chloroform and hence calculate the atomic parachors of C, H, Cl etc
5.	To determine partial molar volume of sodium chloride in aqueous solution at room temperature
6.	To determine the dissociation constants (k_1 and k_2) of a dibasic acid pH metrically.
7.	To find out the (a) cell constant of given conductivity cell, (b) to determine the critical micelle concentration (CMC) of an ionic surfactant.
8.	Determination of ΔG , ΔH and ΔS for a reaction using an electrochemical cell.
9.	To verify law of additivity of absorbance for a mixture of colored substances in solution using potassium permanganate and potassium dichromate solutions.
10.	To determine the concentration of a given solution of an optically active substance by polarimetric measurements.





<u>Inorganic Chemistry</u>	
Synthesis of metal complexes, double salts and estimation by gravimetry. 1. Hexa ammine nickel(II) chloride. 2. Ferrous ammonium sulphate. 3. Mercury tetrathiocyanatocobaltate. 4. Tris-acetylacetonato Manganese(II) chloride. 5. Pottasiumtrioxalatoferrate 6. Prussian blue 7. Hexaure chromic chloride. 8. Tetra ammine copper sulphate 9. Cis – trans- bis oxalate, diaquo chromate(III)	
Qualitative Analysis (6 + 1 Radicals) 6 – Cation, Anion variable 1 – Rare earth element form the following: Th, Ce, Li, Mo, Se, Te, V, Ti and Zr etc.	
<u>Organic Chemistry</u>	
1.	Claisen-Schmidt Reaction: Benzal-acetophenone from acetophenone/ Dibenzalacetone from Benzaldehyde
2.	Backmann rearrangement: Benzanilide from Benzophenone/Acetanilide from acetophenone.
3.	Diels-Alder reaction: 9,10-dihydroanthracene- α,β -succinic anhydride from anthracene.
4.	Sandmeyer reaction: Aniline to chlorobenzene, p-nitroaniline to p-nitrochlorobenzene, Anthranilic acid to ochlorobenzoic acid, o-toluidine to o-chlorotoluene, p-iodonitrobenzene from pnitroaniline, m-nitrophenol from m-nitroaniline etc.
5.	Fisher indole synthesis: 1,2,3,4-Tetrahydrocarbazole from Cyclohexanone.
6.	Lieben haloform reaction: Iodoform from Acetone.
7.	Knorr-Quinoline synthesis: 2-hydroxy-4-methylquinoline from Acetoacetanilide.
8.	Kolbe-Smith reaction: 2,4-dihydroxybenzoic acid from resorcinol.
9.	Cannizarro reaction: Benzyl alcohol and Benzoic acid from Benzaldehyde.





10.	Mannich base synthesis: Benzyliminoethylphenylketone from acetophenone, formaldehyde and benzylamine.
11.	Boiling point determination of unknown liquid samples.
	Estimations: 1. Hydroxyl Group Estimation 2. Unsaturation Estimation 3. Phenol/ Aniline Estimation 4. Ascorbic Acid (Vitamin-C) Estimation 5. Acid + Amide / Acid + Ester Estimation

Teaching-Learning Methodology	We have forged over the last few years traditional and some of the innovative approaches as teaching learning methodologies such as: Direct Instruction and performance of experiments in the laboratory.
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Evaluation Pattern:		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Practical Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcomes: Having completed this course:	
1.	The students will be exposed and apply the basic principles involved: to determine the heat of solution of the given acid by solubility method, determination of hydrolysis constant of aniline hydrochloride by distribution method, determination of the critical solution temperature (CST) of the phenol/water system and to study the effect of additive on CST, to determine the surface tension of methyl acetate, ethyl acetate, hexane and chloroform and hence calculate the atomic parachors of C, H, Cl etc, to determine partial molar volume of sodium chloride in aqueous solution at room temperature.
2.	The students acquired laboratory skills to handle the typical determination of kinetic aspects of reactions, acid strength and dissociation constants, inorganic ion species etc.
3.	Synthesize metal complexes, chelates, double salts and pigments.





4.	Get an expertise in determining the percentage purity of these synthesized compounds.
5.	Perform semi micro qualitative analysis of inorganic mixture containing seven radicals including rare earth elements.
6.	They have practical approach in synthesis of molecules based upon name reactions like Backmann rearrangement, Diels-Alder reaction, Sandmeyer reaction, Fisher indole synthesis, Lieben haloform reaction, Knorr-Quinoline synthesis, Kolbe-Smith reaction, Cannizarro reaction, Mannich base synthesis.
7.	Be able to perform hydroxyl group estimation, unsaturation estimation, phenol/ aniline estimation, ascorbic acid (vitamin-c) estimation and acid + amide / acid + ester estimation

Suggested References:

Sr. No.	References
1.	Experimental Physical Chemistry by R. C. Das & B. Behera, (Tata McGraw hill Publishing Company Ltd., New Delhi)
2.	A Laboratory Manual of Experiments in Physical Chemistry by D. Brennan and C. F. H. Tipper, (McGraw hill Publishing Company Ltd., London)
3.	Systematic Experimental Physical Chemistry by S. W. Rajbhoj and T. K. Chondhekar, (Anjali Publication, Aurangabad)
4.	Advanced Practical Physical Chemistry by J. B. Yadav, (Goel Publishing House, Meerut)
5.	Experimental Physical Chemistry by G. Peter Matthews, (Clarendon Press, Oxford, London)
6.	Experimental Physical Chemistry by V. D. Athawale and Parul Mathur, (New Age International Publishers, New Delhi)
7.	Advanced Physical Chemistry Experiments by Gurtu and Gurtu, (Pragati Prakashan, Meerut)
8.	Advanced Physico-Chemical Experiments by J. Rose, (Sir Isaac Pitman & Sons Ltd., London)
9.	Experiments in Physical Chemistry by D. P. Shoemaker, C. W. Garland and J. W. Nibler, (McGrawHill International Edition, London)





10.	Advanced Practical Inorganic Chemistry – Gurdeep Raj Goel Publishing House, Meerut.
11.	Qualitative Inorganic Analysis. – A. I. Vogel, 6th Edition revised by G. Svehla ELBS – London
12.	Textbook of Chemistry Analysis – A. I. Vogel
13.	Qualitative Chemistry semi micro analysis – edited by P. K. Agasyan CBS Publisher-Delhi.
14.	Chemistry: Inorganic Qualitative Analysis in the Laboratory, Clyde Metz, Elsevier, 2012, ISBN: 978032316104
15.	Elementary Practical Organic Chemistry (part-1 to 3) By A. I. Vogel (CBS publication)

On-line resources to be used if available as reference material:

On-line Resources: From time to time there are many Online resources, including web sites, databases, e-books, bibliographies and platforms that offer educational videos, lectures on a range of topics can be suggested or displayed to the students.

Major Web Sites used for Laboratory Activities like the Interactive Lab Primer; the Laboratory Safety Institute (LSI); Virtual Chemistry

