



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

Course Code	PS02CCHE54 & PS02CCHE55	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.• Quantification of metal ions using different titrations.• Identification and separation of radicals present in inorganic mixture.• Estimation of organic functional group/molecules by titrimetric methods.
---------------------------	--

Course Content	
Sr. No.	Description
	<u>Physical Chemistry</u>
1.	To determine the rate of acid – catalyst iodination of acetone in presence of excess acid and acetone at room temperature.
2.	To determine the molecular weight of given liquid by steam distillation method.
3.	Determination of the Critical micelle concentrations (CMC) and surface active parameters of surfactant by surface tension method.
4.	To determine the transition temperature of Glauber's salt by solubility method.
5.	To determine the partition coefficient of ammonia between CHCl_3 and H_2O .
6.	Determination of strengths of halides in a mixture potentiometrically
7.	To determine the rate constant of the saponification of ethyl acetate at different temperatures
8.	To verify the law of refraction for given glycol + water mixture
9.	To determine the molecular composition of ferric – salicylate complex by Job's method.
10.	To study the inversion of cane sugar by polarimeter.
	<u>Inorganic Chemistry</u>





Quantitative Analysis: 1. Direct Titration (Cu^{+2} , Ni^{+2} , Ca^{+2} , Mg^{+2} and Fe^{+3}) 2. Indirect Titration of Calcium 3. By Back Titration and Replacement titration 4. Determination of composition of complex and interference study. 5. Water Analysis	
Qualitative Analysis (6 + 1 Radicals) 6 – Cation, Anion variable 1 – Rare earth element from the following: Th, Ce, Li, Mo, Se, Te, V, Ti and Zr etc.	
	<u>Organic Chemistry</u>
1.	Aspirin from salicylic acid [Acetylation]
2.	Acetanilide from aniline
3.	p-Bromoaniline from aniline [Protection, Bromination and Deprotection]
4.	p-nitroaniline from aniline [Protection, Nitration and Deprotection]
5.	Nitrobenzene from benzene/ m-dinitrobenzene from nitrobenzene [Nitration]
6.	p-nitro bromobenzene from bromobenzene
7.	Picric acid from phenol
8.	o- and p-nitrophenol from phenol
9.	2,4,6-tribromophenol/ 2,4,6-tribromoaniline [Bromination]
10.	1,3,5-tribromobenzene from aniline [Bromination and deamination]
11.	1-Phenylazo- β -naphthol [Diazo coupling]
12.	Methyl orange from sulphanilic acid
13.	2,5-Dimethylbenzenesulfonic acid [Sulphonation]
14.	Terphthalic acid from p-xylene [Oxidation]
15.	m-nitroaniline from nitrobenzene [nitration and partial Reduction]
16.	Phenol Formaldehyde Resin
17.	TLC for separation and R _f value determination of components in a mixture
	Estimations: 1. Estimation of Aniline. 2. Polyhydric alcohol estimation. 3. Percentage halogen estimation by modified Stepanow's method





4. Estimation of aldehydes / ketones. 5. Sugar estimation [Reducing and Non-reducing].

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.
--------------------------------------	---

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 rate of acid – catalyst iodination of acetone in presence of and acetone at room temperature, to calculate the molecular weight of given liquid by steam distillation method., to study the Critical micelle concentrations (CMC) and surface active parameters of surfactant by surface tension method, to measure the transition temperature of Glauber's salt by solubility method and to estimate the partition coefficient of ammonia between CHCl_3 and H_2O etc. as selective examples
2.	Student gained during theory teaching to the practical aspects such as monitoring rate of saponification, rate of muta-rotation of sugar, quantitative determination using spectrophotometry and refractometer. The students are trained to handle the experimental set up including standardization.
3.	Determine the percentage of metal ion using complexometric titration, replacement titration and back titration.
4.	Analyze water samples.
5.	Perform semi micro qualitative analysis of inorganic mixture containing seven radicals including rare earth elements.
6.	Perform different types of chemical reactions like Acetylation, Bromination, Nitration, deamination, diazo coupling, sulphonation, oxidation and partial reduction
7.	Synthesize different resin, dye and drug molecules
8.	Monitor reaction progress by TLC





9.	Perform Aniline estimation, Polyhydric alcohol estimation, Percentage halogen estimation, estimation of aldehydes / ketones and Sugar 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.	Water Quality-An Introduction, Second edition, Claude E. Boyd.
16.	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

