INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**BACHELOR OF SCIENCE (CHEMISTRY)**
SEMESTER	**6**
COURSE TITLE	**LABORATORY - VI**
COURSE CODE	**02CY0359**
COURSE CREDITS	**6**

Objective:

1 To equip students with the necessary skills to conduct experiments, analyse data, and interpret results accurately and to demonstrate the practical application of theory covered within the scope of Chemistry.

Course Outcomes: After completion of this course, student will be able to:

1 In order to maintain a safe working environment, students will follow safety protocols and procedures, recognizing potential dangers, reducing risks, and reacting appropriately to crises.

2 Students will be able to learn and develop different practical skills in Chemistry.

3 Students will use the theoretical knowledge they have learned in lectures to plan experiments, evaluate information, and make decisions in a lab setting.

Pre-requisite of course: Students having a background in the science stream with a focus on chemistry.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	12	0	0	0	50	50

Contents : Unit	Topics	Contact Hours
Total Hours		

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Advanced Inorganic Chemistry Experiments** 1. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions-Li. 2. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions-Mo. 3. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions-W. 4. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions-V. 5. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions-Zr. 6. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions Se. 7. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions-Ti. 8. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions-Cl - , Br , I-. 9. Qualitative analysis: Analysis of mixture containing six radicals including one rare metal ions Cl-, SO42- . 10. Qualitative analysis: Analysis of mixture containin g six radicals including one rare metal ions-NO2-, NO3-. 11. Qualitative analysis: Analysis of mixture containing six radicals including soluble Phosphate. 12. Qualitative analysis: Analysis of mixture containing six radicals including insoluble Phosphate.	30
2	**Advanced Organic Chemistry Experiments** 1. Organic Qualitative Analysis – Identification of Unknown Compounds in a Mixture 2. Synthesis of Aspirin (Acetylsalicylic Acid) 3. Preparation of Benzophenone using Friedel-Crafts Acylation React benzene with benzoyl chloride in presence of AlCl3. 4. Synthesis of p-Nitroaniline from Acetanilide Stepwise Nitration ? Hydrolysis of acetanilide. 5. Preparation of Dibenzalacetone (Claisen-Schmidt Condensation) React benzaldehyde with acetone in basic medium. 6. Preparation of 2,4-Dinitrophenylhydrazone DerivativeReact carbonyl compound with 2,4-DNP reagent. 7. Synthesis of Methyl Orange (Azo Dye Synthesis) Diazotization of sulfanilic acid and coupling with dimethylaniline. 8. Synthesis of Benzimidazole React o-phenylenediamine with formic acid. 9. Synthesis of Phenolphthalein Condensation of phthalic anhydride with phenol in. acidic conditions. 10. Preparation of iodoform (Haloform Reaction) React methyl ketones with I2/NaOH. 11. Synthesis of Paracetamol (Acetaminophen)Acetylation of p-aminophenol with acetic anhydride. 12. Purification of compounds by column chromatography	30

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	**Advanced Physical Chemistry Experiments** 3 Advanced Physical Chemistry Experiments 1. To examine Lambert-Beer's law in concentrated solutions using colorimetry. 2. To determine the concentration of the given KMnO 4 solution by verifying the Beer's law using colorimeter. 3. To find the amount of Ni +2 in the given solution by colorimetry. 4. To find the amount of Fe +3 in the given solution by colorimetry. 5. To find the specific rotation of given substance by using three different concentrations, i.e., 10%, 5% and 2.5%. Draw the graph of concentration vs rotation angle and find out the concentration of unknown solution using Polarimeter. 6. To study the inversion rate of cane sugar in presence of 1 N HCl and determine the rate of reaction using Polarimeter. 7. To find the surface tension of the liquids A, B, and C by using Drop weight method. Find the value of Parachor of liquids and -CH2 group. 8. To determine the concentration of Ni+2 with the help of 0.1 M EDTA by conductometry. 9. To determine the normality of xN AgNO3 with the help of 0.5 N NaCl by conductometry. 10. To estimate the amount of potassium di chromate present in100 cm3 of the given solution using the prepared 0.1N ferrous ammonium sulphate solution by potentiometric titration. 11 To study the distribution of Iodine between H2O and CCl4. 12. To perform potentiometric titration of strong/weak and against weak/strong base.	30
4	**Advanced Analytical Chemistry Practicals** 1.Separation of plant pigments by paper chromatography. 2.To determine the Rf value of given amino acids (Cysteine, Glycine, Valine) by Ascending Paper Chromatography.3.To determine the Rf value of given amino acids (Cysteine, Glycine, Valine) by Circular Paper Chromatography.4.To determine the Rf value of given amino acids (Thionine, Alanine, Valine) by Ascending Paper Chromatography 5.To determine the Rf value of given amino acids (Thionine, Alanine, Valine) by Circular Paper Chromatography 6.To determine the Rf value of given inorganic cations (Co+2, Cu+2 and Ni+2) by Ascending Paper Chromatography. 7.To determine the Rf value of given inorganic cations (Co+2, Cu+2 and Ni+2) by Circular Paper Chromatography. 8. Separation of amino acids by Thin Layer Chromatography. 9.Separation of dyestuffs by Thin Layer Chromatography. 10. Separation of KMnO4 and K2Cr2O7 by column chromatography. 11. RP-HPLC Method for Estimation of Paracetamol in Tablets. 12. Determination and Forced Degradation for Simultaneous Quantification of Paracetamol and Ibuprofen in Pharmaceutical Dosage Form by RP-HPLC Method.	30
Total Hours		**120**

Textbook :

1 Vogel's Textbook of Practical Organic Chemistry, , A.I. Vogel, A.R.Tatchell, , Prentice Hall,, 1989

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Textbook :

2 Textbook of quantitative chemical analysis,, G. H. Jeffery J. Bassett J. Mendham R C. Denney, John , Wiley & Sons, , 1989

3 Experimental Physical Chemistry: A Laboratory Textbook, Arthur Halpern and George McBane, , W.H. Freeman & Co Ltd, , 2006

4 An Advanced Course in Practical Chemistry, A. K. Nad, B. Mahapatra and A. Ghoshal,, New Central Book Agency (P) Ltd,, 2022

References:

1 Vogel's Qualitative Inorganic Analysis (7th Edition), , Vogel's Qualitative Inorganic Analysis (7th Edition), , G. Svehla, , Dorling Kindersley (India) Pvt. Ltd, 2009, 2009

2 Practical in Physical Chemistry, Practical in Physical Chemistry, , Practical in Physical Chemistry, Practical in Physical Chemistry, , P S Sindhu, , Macmillan, 2005

3 Manual of Organic Chemistry, Manual of Organic Chemistry, Robert V. Miller, Marylynn V. Yates, Cindy H. Nakatsu, and Suresh D. Pillai, , ASM Press, , 2016

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
0.00	0.00	0.00	0.00	0.00	0.00

Instructional Method:

1 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

2 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

3 .Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.

4 All students in the laboratory must wear lab coats during lab session.

5 During practical and experimental section student must wear shoes to avoid accidents cause by spilling or rush handling of acidic chemicals (Especially during inorganic estimation experiments).

Supplementary Resources:

1 http://ocw.mit.edu/courses/chemistry/

2 https://www.youtube.com/watch?v=FUo428guKt0

3 https://www.youtube.com/watch?v=qPjGbrd4nJw

4 https://www.youtube.com/watch?v=3WvrzQceIso

5 https://www.youtube.com/watch?v=oqSGrRzd0mI

6 https://www.youtube.com/watch?v=4UH9ciVrCes

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Supplementary Resources:

7 https://www.youtube.com/watch?v=0nKiVn1jcqg

8 https://www.youtube.com/watch?v=zo8-LToVuFk

9 https://www.youtube.com/@sdchemistryacademy-b.sc.526

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