

INSTITUTE	FACULTY OF SCIENCE
PROGRAM	MASTER OF SCIENCE (CHEMISTRY)
SEMESTER	2
COURSE TITLE	PRACTICALS - II
COURSE CODE	02CY0461
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 the organic, analytical, physical and inorganic chemistry.

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

- 1 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 organic, analytical, physical and inorganic 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:N/A

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	12	0	0	0	100	100
Contents : Unit	Topics						Contact Hours
Total Hours							

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Physical Chemistry 1) To determine the constant of sodium acetate in water. 2) To determine the normality and dissociation constant of xN oxalic acid by potentiometric titration. 3) To study the inversion of sucrose to determine the rate constant for the inversion of sucrose 4) To determine the concentration of strong and weak acid in a given mixture by conductometry 5) To determine the order of the reaction between $k_2s_2o_8$ and k_i by colorimetric method. 6) To determine the concentration and amount of ni^{2+} in the given solution by colorimetry. 7) To determine the rate constant in water using nh_4cl by pH metry 8) To determine the normality and dissociation constant of weak acid by pH metry 9) To find the amount of Ni^{2+} in the given solution by colorimetry 10) Determination of relative viscosity of a, b, c, d using an Ostwald viscometer 11) To find out the constant of the given cell by conductometer method and also determine the normality of xN HCl and g/litre. 12) To determine the cell constant of a given conductivity bridge	30
2	Inorganic Chemistry 1) Qualitative analysis of unknown Inorganic salts of six radicals containing Cl^- and Br^- ions. 2) Qualitative analysis of unknown Inorganic salts of six radicals containing Cl^- and SO_4^{2-} ions. 3) Qualitative analysis of unknown Inorganic salts of six radicals containing NO_2^- and NO_3^- ions. 4) Qualitative analysis of unknown Inorganic salts of six radicals containing PO_4^{3-} and MoO_4^{3-} ions. 5) Qualitative analysis of unknown Inorganic salts of six radicals containing PO_4^{3-} and SO_4^{2-} ions. 6) Qualitative analysis of unknown Inorganic salts of six radicals containing PO_4^{3-} , MoO_4^{3-} and SO_4^{2-} ions. . 7) Qualitative analysis of unknown Inorganic salts of six radicals containing one rare metal ion (Li). 8) Qualitative analysis of unknown Inorganic salts of six radicals containing one rare metal ion (W). 9) Qualitative analysis of unknown Inorganic salts of six radicals containing one rare metal ion (Se). 10) Qualitative analysis of unknown Inorganic salts of six radicals containing two rare metal ions (Li/W/Se). 11) Qualitative analysis of unknown Inorganic salts of six radicals containing three rare metal ions (Li, W and Se). 12) Qualitative analysis of unknown Inorganic salts of six radicals containing Fe^{+2} and Fe^{+3} ions.	30

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	Organic Chemistry (Multistep synthesis – Any 4) 1) To prepare 2, 3-diphenylthiazolidone from benzaldehyde. 2) To prepare benzanilide from benzophenone. 3) To prepare anthraquinone from phthalic anhydride. 4) To prepare 4-benzylidene 2-phenyl oxazole 5-one from glycine. 5) To prepare 2-phenyl indole from acetophenone. Organic Qualitative Analysis of mixture of organic compounds (mixture of 2 and 3 organic compounds): Identification of single solid organic compounds by chemical tests and preparation of a suitable solid derivative after consulting literature. Tests include- a) Determination of m.p. of solid sample b) Detection of special Elements (Nitrogen, Halogens, Sulphur) c) Solubility in solvents at room temperature and classification d) Preliminary tests e) Test for functional group/s [aromatic 1°, 2°, 3° amino, anilido-, nitro-, amido-, phenolic–OH, carboxylic acid, carbonyl (keto, aldehyde), ester-, unsaturation, and hydrocarbon]. f) Preparation of at least one solid derivative including recrystallisation. At least FOUR unknown samples to be performed during lab session.	30
4	Analytical Chemistry 1) Estimation of ferrous and ferric ions in the given sample. 2) To determine the total protein content in the given sample of milk. 3) To determine solid content in the given milk sample. 4) To determine the amount of ascorbic acid in the given sample. 5) To determine the percentage of starch in the given turmeric powder. 6) To determine the percentage of tannin content in the given sample of tea leaves. 7) To determine the chlorine content from the water sample. 8) Estimation of Ca ²⁺ and Zn ²⁺ in admixture. 9) To determine the amount of Ni ²⁺ using DMG. 10) To determine the percentage of chlorine in the given sample of chlorinated lime or bleaching powder. 11) To study the partition coefficient of acetic acid between water and chloroform. 12) To study the distribution coefficient of benzoic acid between toluene and water at room temperature.	30
Total Hours		120

Textbook :

- 1 Vogel's Textbook of Practical Organic Chemistry, A.I. Vogel, A.R. Tatchell, Prentice Hall, 1989
- 2 Experimental Physical Chemistry: A Laboratory Textbook, Arthur Halpern and George McBane, W.H. Freeman & Co Ltd, 2006
- 3 Textbook of quantitative chemical analysis, G. H. Jeffery J. Bassett J. Mendham R C. Denney, John Wiley & Sons, 1989

References:

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

References:

- 2 Practical in Physical Chemistry, Practical in Physical Chemistry, P S Sindhu, Macmillan, 2005
- 3 Multi-Step Organic Synthesis: A Guide Through Experiments, Multi-Step Organic Synthesis: A Guide Through Experiments, Nicolas Bogliotti , Wiley-VCH, 2017
- 4 Practical Manual of Qualitative Organic Analysis, Practical Manual of Qualitative Organic Analysis, Dr. Mrs. Hetal , Nirali Prakashan, 2007
- 5 Handbook of inorganic qualitative analysis, Handbook of inorganic qualitative analysis, Maharudra Chakraborty, SCIFINITY PUBLICATION, 2019
- 6 Laboratory Experiments in Analytical Chemistry, Laboratory Experiments in Analytical Chemistry, Maurice O. Iwunze, AuthorHouse, 2005

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
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.
- 2 All students in the laboratory must wear safety goggles and lab coats during lab session.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.
- 4 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Supplementary Resources:

- 1 <https://www.youtube.com/watch?v=yhLFR4JZ0HI&list=PLP2rTr-GgPLifg5vYjhVo7u6HBp1uYcdm>
- 2 https://www.youtube.com/watch?v=ru8fOk2f9G0&list=PLDT2d3qkCdHQ_Dkjz9Ak29AL4AYgdaAAg
- 3 <https://www.youtube.com/watch?v=qPjGbrd4nJw&t=1s>
- 4 <https://www.youtube.com/watch?v=ZwqLCX-TN8c&list=PLybg94GvOJ9Gn1tz2Wle-75UuZSL3wSJK>
- 5 <https://www.youtube.com/watch?v=QqKO0jCT5wg>
- 6 <https://vlab.amrita.edu/index.php?sub=2>