

INSTITUTE	FACULTY OF SCIENCE
PROGRAM	BACHELOR OF SCIENCE (CHEMISTRY)
SEMESTER	4
COURSE TITLE	ELEMENTARY CHEMISTRY-IV
COURSE CODE	02CY0254
COURSE CREDITS	4

Objective:

- 1 To identify and apply suitable organic name reactions and rearrangements in synthetic strategies.
- 2 To understand and preparation and reactions of the heterocyclic compounds of 5 and 6 membered rings.
- 3 To study the fundamental concepts of organometallic, including discussions on the 18-electron rule, molecular orbital theory, and factors influencing metal-ligand interactions.
- 4 To study the details of the concept “phase” and to understand phase rule.

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

- 1 Recognize and identify a wide range of organic name reactions and rearrangements.
- 2 To predict and interpret the physical properties, chemical properties and preparation of heterocyclic compounds.
- 3 Familiar with synthetic methods for preparing organometallic compounds including understanding their structural features and bonding patterns.
- 4 Understand the basic of phase rule.

Pre-requisite of course: Before starting to study this course, student should have knowledge regarding organic chemistry course and matter phases.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Name reactions and Rearrangements Mechanism and applications of Arndt Eistert reaction, Barbier-Wieland reaction, Grignard reaction, Kolbe synthesis, Michael addition, Mannich reaction, Wurtz reaction, Beckmann rearrangement, Hoffmann rearrangement, Curtius rearrangement, Fries rearrangement.	15

Contents : Unit	Topics	Contact Hours
2	Heterocyclic compounds of 5 and 6 membered rings Introduction, physical properties of pyrrole, furan and thiophene, synthesis of pyrrole (Knorr synthesis, Paal-Knorr synthesis, Hantzsch synthesis), chemical reactions of pyrrole, synthesis of furan (Paal-Knorr synthesis, Feist-Bénary reaction, from other heterocyclic system), chemical reactions of furan, synthesis of thiophene (Paal-Knorr synthesis, Simmon-smith reaction, from unsaturated compounds), chemical reactions of thiophene, Synthesis, physical and chemical properties of pyridine and Quinoline.	15
3	Organometallic compounds Introduction Metallic Carbonyls: General methods of preparation, general properties, Structure and nature of M-CO bonding in carbonyls, Effective atomic number (EAN) rule as applied to metallic carbonyls, 18-electron rule as applied to metallic carbonyls, some carbonyls, Metallic Nitrosyls: metal nitrosyls, Effective atomic number (EAN) rule as applied to metallic nitrosyls.	15
4	Phase rule Introduction, What is Meant by a 'Phase', What Is Meant by 'Components', Degrees of Freedom, Derivation of the Phase Rule, Derivation of the Phase Rule, Experimental Determination of Transition Point, The Water System, The Sulphur System, Two-component Systems: The Silver-Lead System, The Magnesium-Zinc System, Three component system: Representation of triangular plot, partially miscible ternary liquid system.	15
Total Hours		60

Textbook :

- 1 A Textbook of Physical Chemistry, K. L. Kapoor, Macmillan Publishers India Limited, 2004
- 2 Heterocyclic Chemistry, Raj K. Bansal, New edge international P Ltd, 2020
- 3 A Textbook of Organic Chemistry, Bahl, S Chand Publishing, 2005

References:

- 1 Physical Chemistry, Physical Chemistry, G. W. Castellan, Narosa Publishing House, New Delhi, 1983
- 2 Physical Chemistry, Physical Chemistry, Arun Bahl & J. D. Tuli, S. Chand Publishing, 2000
- 3 Organic Reactions and their Mechanisms, Organic Reactions and their Mechanisms, P. S. Kalsi, New Age International Publishers, 2009
- 4 Organic Chemistry, Organic Chemistry, R. T. Morrison and R. N. Boyd, Prentice Hall of India, 2011

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
20.00	30.00	25.00	15.00	10.00	0.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 <http://nptel.ac.in/course.php?disciplineId=104>
- 2 <http://ocw.mit.edu/courses/chemistry/>
- 3 <http://vlab.amrita.edu/index.php?sub=2>
- 4 http://www.vlab.co.in/ba_labs_all.php?id=9
- 5 <https://www.youtube.com/user/TMPChem>
- 6 <https://www.youtube.com/playlist?list=PL166048DD75B05C0D>
- 7 <https://www.youtube.com/channel/UCqk-dmk3AOFtikaFDpsZorg>
- 8 <https://www.youtube.com/user/PradeepKshetrapal>