

Subject Code: 02CY0252
Subject Name: Fundamental Chemistry-IV
B.Sc. Sem - IV
Objectives:

- To study basics of the name reaction and the rearrangement.
- To understand and preparation and reactions of the heterocyclic compounds of 5 and 6 membered rings.
- To study the introduction of organometallic compounds, their preparations and their properties.
- To study the details of the concept “phase” and to understand phase rule.

Credits Earned: 6 Credits

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

- Understand the important name reactions in organic chemistry course and rearrangement.
- Will know the basics of heterocyclic compounds and know the preparations.
- Obtain the information regarding organometallic compounds.
- Understand the basic of phase rule.

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

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva (V)	Term Work (TW)	
5	-	2	6	50	30	20	25	25	150

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
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, FiestBenary 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 WaterSystem, 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

References:

1. A Textbook of Physical Chemistry; K. L. Kapoor
2. An Introduction to Chemical Thermodynamics; R. P. Rastogi, R. R. Misra, 6th Edition, Vikas Pub. Pvt. Ltd.
3. Physical Chemistry; G. W. Castellan, 3rd Edition, Narosa Publishing House, New Delhi.
4. Physical Chemistry; Arun Bahl & J. D. Tuli, S. Chand Publishing.
5. Organic Reactions and their Mechanisms; P. S. Kalsi, New Age International Publishers.
6. Organic Chemistry; R. T. Morrison and R. N. Boyd, 6th Edition, Prentice Hall of India.

8. Concise Inorganic Chemistry; J. D. Lee, 5th Edition, Blackwell Science, London.
9. Basic Inorganic Chemistry; F. A. Cotton, G. Wilkinson
10. Principles of Inorganic Chemistry; B. R. Puri, L. R. Sharma, K. C. Kalia, Vallabh Publications, Delhi
11. Organic Chemistry; Morrison and Boyd
12. Organic Chemistry (Volume I, II & III); S. M. Mukherji, S. P. Singh, R. P. Kapoor.
13. Principles of physical chemistry; B.R. Puri, L.R. Sharma, M.S. Pathania.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per 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	Understand	Apply	Analyze	Evaluate	Create
20%	30%	25%	15%	10%	-

Gravimetric Analysis:

1. To determine the amount of Ni as Ni(DMG)₂ gravimetrically from the acidic solution of NiSO₄.7H₂O.
2. To determine gravimetrically, the amount of Ba present as BaSO₄ in the acidic solution of barium chloride (BaCl₂.2H₂O).
3. To determine the amount of Al as Al₂O₃ from the solution of Al₂(SO₄)₃.18H₂O and free sulphuric acid.

Inorganic Qualitative Analysis:

4. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 1]
5. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 2]
6. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 3]
7. Aim: Qualitative analysis of given unknown inorganic salt. [Four radicals, mixture 4].

Reference Books

1. An Advanced Course in Practical Chemistry, A. K. Nad, B. Mahapatra and A. Ghoshal, New Central Book Agency (P) Ltd.
2. Practicals in Physical Chemistry, P S Sindhu, Macmillan.

3. Experimental Physical Chemistry: A Laboratory Textbook, Arthur Halpern, George McBane, W. H. Freeman.

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

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-dmk3AOfikaFDpsZorg>
8. <https://www.youtube.com/user/PradeepKshetrapal>