



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2020-21
COURSE HANDOUT

Date: 15.01.2021

In addition to part I (General Handout for all courses appended to the Timetable) this portion gives further specific details regarding the course.

Course No : CHEM F242
Course Title : Chemical Experimentation I
Instructor-in-Charge : Indresh Kumar

Tutorial/Practical Instructors: Dalip Kumar, Ajay Kumar Sah, Bharti Khungar, Paritosh Shukla, Indresh Kumar, Prachi Sharma, Gurpreet Kaur, Neha Meena, Narsimha, Dhananjay Shrinivas Nipate, Monika Malik, Taur Prakash Pandurang, Prakriti Saraf, Pragya, Mamta, Nagare Yadav Kacharu, Sushma Narwal, Bhawani, Narendra Dinkar Kharat.

1. Course Description: This course is based on laboratory experiments in organic chemistry. This course is available for second year M.Sc. Chemistry students.

2. Scope and Objective of the Course: The main objective of the course is to provide students with a firsthand experience about basic techniques used in an organic chemistry laboratory. Broadly, the experiments include qualitative organic analysis, detection of known and unknown functional groups, chemical separation of mixture of two compounds, examples of single step and two-step organic syntheses, extraction of organic compounds from natural sources or from drugs, chromatographic separation of pure compound from a mixture obtained in a multistep reaction etc.

3. Textbooks: Vogel's Textbook of Practical Organic Chemistry, 5th Ed.

4. Reference Books: Reference sources for each experiment will be specified, as necessary.

5. Course Plan: The students will perform several experiments in qualitative, synthetic organic chemistry including single-step and multi-step synthesis, extraction of natural products, and training in chromatographic separation, with an emphasis on individual planning and execution of the experiments. The students will be divided in two sections (I & II) and each section will conduct a set of experiments (Lab I or Lab-II experiments) in the first half semester and thereafter interchanging of the students will proceed during the second half of semester. Selected 22 experiments will be discussed and performed in the class.

Topic	Exp No.	Experimental Detail	Learning Outcomes
Lab-I Experiments: Synthesis, extraction, estimation, and purification techniques	1	Chemoselective reduction of organic compound	• Safe laboratory practices, handling of glassware, equipment, and reagents.
	2	Multicomponent reaction (Biginelli Reaction)	• Findings of limiting reagent and percent yield of a single or a multi-step synthesis.
	3	Coumarin synthesis using microwave irradiation	
	4	Synthesis of benzoic acid from benzil using grinding technique	• Understanding the reaction monitoring and product purification techniques like, distillation, recrystallization, aqueous
	5-6	Multistep synthesis	



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	7	Cycloaddition reaction (Diels-Alder Reaction) under heating or microwave conditions	extraction, thin layer and column chromatography.
	8	Separation/purification of an organic compound using column chromatography	• Utilization of characterization techniques like mp, IR, NMR etc.
	9	Isolation of curcumin from <i>curcuma longa</i>	• Understanding the mechanism of some simple organic reactions
	10	Quantitative estimation of Amino acids	• Proper documentation of laboratory work
	11	Nucleophilic Aromatic Substitution	
	1	Elemental Analysis of Known organic compounds (4 Compounds, common)	
Lab-II Experiments*: Qualitative Analysis of Organic Compounds	2-3	Functional group analysis of known compounds (12 Compounds, common) Non-nitrogenous functional groups: Alcohol, Phenol, Aldehyde, Ketone, Alkene, Alkyne (unsaturated compounds), Carbohydrate, Carboxylic acid and Ester Nitrogenous functional groups: Amine, Amide, Nitroaromatics	• Safe laboratory practices, handling of glassware, equipment, and reagents. • Preliminary observation of general physical characteristics of organic compounds Understanding of the organic compounds chemical separation and purification techniques like, distillation, extraction etc.
	4-5	Complete analysis (Elemental analysis & functional group determination) of unknown compounds, & mp determination (min. of two compounds by each student)	• Learning of elements and functional group analysis. • Utilization of characterization techniques like mp, IR and NMR
	6	Separation of mixture by Separation Technique-I: A mixture of water-soluble component and water-insoluble component will be separated by water, and identification of residue by elemental & functional group analysis (one mixture to each student)	• Proper documentation of laboratory work
	7-8	Separation of mixture by Separation Technique-II & Technique-III: A mixture of acidic/basic and neutral components will be separated and identification of acidic/basic and neutral components by elemental and functional group analysis (two different type of mixtures to each student)	



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	9	Separation of mixture by Separation Technique-IV: A mixture of acid and base components will be separated and their analysis (elemental and functional group) will be performed (one mixture to each student)	
	10	Separation of mixture by Separation Technique-V: A mixture of solid/liquid or liquid/liquid will be separated and detailed analysis of both the components will be performed via elemental and functional group analysis (one mixture to each student)	
	11	Separation of unknown mixture: Practice-I	

*In qualitative analysis of compounds/mixtures, NMR and IR will be provided to characterize the compounds.

6. Evaluation Scheme:

Component	Weightage (%)	Date & Time	
Laboratory Work & Reports	80	Continuous	
Lab tests-I and II	20	To be announced	

6a. Marks Distribution: Each Lab experiment will be of 8 Marks.

Distribution of Marks are as follows:

Lab-I Experiments: Attendance (1); Lab quiz (2); Other evaluation component (5).

Lab-II Experiments: Attendance (1); Lab quiz (3); Other evaluation component (4).

7. Notices: All notices concerning the course will be displayed on Nalanda.

8. Make-up Policy: There will be two buffers and therefore if a student misses two labs (for any reason), no make-up will be considered.

Instructor-in-charge
CHEM F242