ZCHE H2103: Organic and Physical Chemistry

Module Title:	Organic and Physical Chemistry
Language of Instruction:	English

Credits:	15

NFQ Level:	6

Module Delivered In	3 programme(s)

Teaching & Learning Strategies:	This module will be taught in three one hour theory classes and one three hour practical session per week. To consolidate lectures and practicals, students will normally be required to carry out assignments and prepare a weekly practical report analyzing their own research and results. Any course-related issue or questions that may arise will be discussed at lectures.

Module Aim:	The aim of this module is to impart knowledge of fundamental organic and physical chemistry and to provide practical training in this subject area with due regard to best practice and safety.

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Draw the structures and shapes of the main types of organic chemicals
LO2	Draw the reaction mechanisms of some of the main reactions in organic and synthetic organic chemistry.
LO3	List, describe and explain the tests used to identify unknown organic chemicals.
LO4	Discuss and explain the physical chemistry of gases and liquids and carry out relevant calculations.
LO5	State and explain the basic laws of thermodynamics and carry out relevant calculations.
LO6	Discuss and explain kinetic theory (the rates of reaction, determine the order of reaction, determine the energy of activation of reactions and carry out relevant mathematical calculations.
LO7	Discuss and explain kinetic theory (the rates of reaction), determine the order of reaction, determine the energy of activation of reactions and carry out relevant mathematical calculations.
LO8	Perform and interpret designated laboratory exercises with due regard to safety and best practice.

Pre-requisite learning		
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*		
4504	SCIE H1111	Chemistry
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*		
No incompatible modules listed		
Co-requisite Modules		
No Co-requisite modules listed		
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*		
No requirements listed		

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Module Content & Assessment

Indicative Content
Aliphatic Hydrocarbons Aliphatic Hydrocarbons. Hybridisation. Physical properties, shapes and reactions of alkanes, alkenes, alkynes and cyclic aliphatic compounds. Conjugated systems
Stereochemistry Stereochemistry, optical activity, optical purity, polarimetry, geometric isomers
Aromatic hydrocarbons Aromatic hydrocarbons. Orbital picture, resonance stabilisation energy of benzene and analogues. Reactions, electrophilic aromatic substitution, reactivity and orientation. Toxicity of aromatics
Organic oxygen containing compounds Alcohols, Aldehydes, Ketones, Carboxylic acids, Esters, Ethers, Acid derivatives. Main reaction mechanisms. Organometallic compounds, Grignard reaction
Organic nitrogen containing compounds Amines, amides. Mechanism of diazotisation.
Fats, oils, waxes, detergents Fats, oils, waxes, detergents. Reactions and analysis.
Introduction to common organic pollutants Introduction to common organic pollutants
Gases The gas laws, kinetic theory of ideal gases. Real gases ad Van der Waals equation. liquefaction and solidification of gases, critical temperatures, pressure and volumes, super critical fluids, industrial uses.
Kinetics Rate equations, collision theory, Arrhenius equation, activation energy, catalysis.
Fundamentals of thermodynamics Thermodynamic laws, entropy, enthalpy, Gibbs free energy, equilibrium reaction, spontaneity.
Practicals One “dry” practical covering relevant calculation. Subsequent practicals will develop the following synthetic skills - distillation, reflux, recrystallisation, soxhlet extraction, multi-step product synthesis, yield calculation, product purity determination, determination of the heats of formation, reaction rate studies, solvent extraction and other specialised reactions.

Assessment Breakdown	%
Continuous Assessment	10.00%
Practical	40.00%
End of Module Formal Examination	50.00%

Special Regulation
Students must achieve a minimum grade (35%) in both the practical/CA and final examination.

Continuous Assessment				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Examination	1 hour exam	1,2,3,4,5,6,7	5.00	n/a
Examination	1 hour exam	1,2,3,4,5,6,7	5.00	n/a

No Project

Practical				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Practical Laboratory report book	8	40.00	End-of-Semester

End of Module Formal Examination				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	3 hour exam	1,2,3,4,5,6,7,8	50.00	End-of-Semester

ITCarlow reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	30 Weeks per Stage	3.00
Laboratory	30 Weeks per Stage	3.00
Estimated Learner Hours	30 Weeks per Stage	2.00
	Total Hours	240.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_SASES_B	Bachelor of Science (Honours) in Environmental Science	2	Mandatory
CW_SAASC_D	Bachelor of Science in Analytical Science	2	Mandatory
CW_SASCI_C	Higher Certificate in Science in Applied Biology or Applied Chemistry	2	Group Elective 2