

CHEM S7012: Pharmaceutical Chemistry

Module Details	
Module Code:	CHEM S7012
Full Title:	Pharmaceutical Chemistry APPROVED
Valid From::	Semester 1 - 2018/19 (September 2018)
Language of Instruction:	English
Duration:	1 Semester
Credits::	7.5
Module Owner::	
Departments:	Unknown
Module Description:	•To expand on the range of organic functional groups and increase the students knowledge of organic chemistry including more detailed organic synthetic reaction pathways and mechanisms. •To introduce the student to the importance of stereoisomerism and the impact on chiral pharmaceutical drugs. •To introduce the student to a wide diversity of natural product chemicals which influence pharmaceutical chemistry.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	Module Learning Outcome Description
MLO1	Identify a greater range of organic functional groups including aromatic, heterocyclic and stereochemical compounds.
MLO2	Discuss a variety of organic synthetic reaction pathways and mechanisms.
MLO3	Analyse relevant data from provided Nuclear Magnetic Resonance (NMR) spectra.
MLO4	Assimilate the diversity of natural products and their use as pharmaceutical sources.
MLO5	Practice safe organic chemistry laboratory skills for routine procedures and pharmaceutical synthesis.
MLO6	Examine results from scientific practicals and discuss their importance in practical reports.
Pre-requisite learning	
Module Recommendations <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>	
No recommendations listed	

Module Indicative Content
Nitrogen Compounds: aliphatic and aromatic Classification and nomenclature of amines (aliphatic and aromatic) and amides. Properties, synthesis and reactions of primary, secondary, tertiary amines and aniline. Basicity of amines and comparison of basicity with amides. Sulphanilamide and sulfa drugs.
Heterocyclic compounds Introduction, nomenclature and structure of common heterocyclic structures. Pharmaceutical uses and synthesis of non-aromatic heterocyclics including pyrrolidine, piperidine and tetrahydrofuran. Conditions for maintaining aromaticity in aromatic heterocyclics. Pharmaceutical uses and synthesis of aromatic heterocyclics including pyrrole, furan, thiophene and pyridine.
Benzene and aromatic chemistry Benzene: structure, resonance. Nomenclature of substituted benzene. Conditions for aromaticity including Huckels rule. Electrophilic aromatic substitution (EAS) reactions (including halogenation, sulphonation, nitration, Friedel Crafts alkylation and acylation). Substituted benzene reactions, activating and deactivating groups.
Stereochemistry Stereochemistry of simple organic molecules, recognising a chiral molecule, R and S nomenclature. Optical activity, enantiomeric excess, diastereoisomers. The impact of stereochemistry on pharmaceutical products. Separation of racemic mixtures and Chiral synthesis.
Carbonyl Compound Reactivity Alpha-carbon chemistry; formation of enols (keto-enol tautomers) and enolate ions. Alpha- substitution reactions. Aldol reaction and mixed aldol reaction. Claisen condensation and intramolecular Claisen condensation (Dieckmann cyclisation). Michael addition reaction (beta-carbon chemistry).
Nuclear magnetic resonance spectroscopy Introduction to ¹ H NMR and ¹³ C NMR. Chemical shift, integration, spin-spin splitting, interpretation of spectra.
Pharmaceutical products from natural sources Alkaloids, Vitamins, Steroids, Terpenes, and Nucleic acids: Structures, classifications, nomenclature, medical applications and the physiological effects on humans from these naturally occurring compounds.
Practical A range of synthetic preparations, natural product isolation and medication analysis will be undertaken to give experience of organic synthetic techniques and pharmaceutical analysis. Qualitative organic analysis, identification of simple compounds by physical and chemical tests. Extraction and purification of organic materials from natural sources. In the above preparations where appropriate the students will use chromatographic and/or spectroscopic methods, to check purity and identity of the products.

Module Assessment	
Assessment Breakdown	%
Course Work	10.00%
Practical	30.00%
Final Examination	60.00%
Module Special Regulation	

Assessments

Full Time On Campus			
Course Work			
Assessment Type	Continuous Assessment	% of Total Mark	10
Marks Out Of	0	Pass Mark	0
Timing	S1 Week 8	Learning Outcome	1,2
Duration in minutes	0		
Assessment Description A detailed open-book assignment is set to examine the students ability to independently research the required questions set. The student must research the answer in both supplied lecture notes and outside references (books, websites etc.)			
No Project			
Practical			
Assessment Type	Practical/Skills Evaluation	% of Total Mark	30
Marks Out Of	0	Pass Mark	0
Timing	Every Week	Learning Outcome	5,6
Duration in minutes	0		
Assessment Description A 3-hour weekly practical session will provide the student with the opportunity to back up the theory covered in formal lectures and discussed in tutorials with practical experience. A range of exercises will be set. Each week, students will indicate whether they have successfully completed an exercise and comment appropriately			
Final Examination			
Assessment Type	Formal Exam	% of Total Mark	60
Marks Out Of	0	Pass Mark	0
Timing	End-of-Semester	Learning Outcome	1,2,3,4
Duration in minutes	0		
Assessment Description End-of-Semester Final Examination			
Reassessment Requirement			
A repeat examination Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.			

Module Workload

Workload: Full Time On Campus

<i>Workload Type</i>	<i>Contact Type</i>	<i>Workload Description</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>	<i>Hours</i>
Lecture	Contact	No Description	Every Week	3.00	3
Practical	Contact	No Description	Every Week	3.00	3
Directed Reading	Non Contact	No Description	Every Week	3.00	3
Independent Study	Non Contact	No Description	Every Week	3.00	3
				Total Weekly Learner Workload	12.00
				Total Weekly Contact Hours	6.00

This module has no Part Time On Campus workload.

Module Resources

Recommended Book Resources

Klein, D. Organic Chemistry, 1st. Wiley, [ISBN: 9780471756149].
Bruice, P. Organic Chemistry, 7th. Pearson, [ISBN: 9780321697684].
Hart, Craine, Hart. (2007), Organic Chemistry - A short course, 12th. Houghton Mifflin, [ISBN: 0618215360].
Atkins, R.C., Carey F.A.. (2007), Organic Chemistry a brief course, 3rd. Mc Graw Hill, [ISBN: 9780071266208].

Supplementary Book Resources

Quin, Tyrell. (2010), Fundamentals of Heterocyclic chemistry: Importance in nature and in the synthesis of pharmaceuticals, Electronic book. Wiley, [ISBN: 9780470566695].
Balcii, M. Basic ¹H and ¹³C NMR Spectroscopy, Electronic book. Elsevier, [ISBN: 9780444518118].
Palleros, D.R. Experimental Organic Chemistry, 1st. Wiley, [ISBN: 0471282502].

This module does not have any article/paper resources

Other Resources

Website, Dr Chiara Hanlon. Lecture notes and further resources, DkIT Moodle.
Website, Virtual Textbook of Organic Chemistry,
<http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm>
Website, Organic Chemistry Review,
<http://mcat-review.org/organic-chemistry.php>
Website: Database for IR, MS, NMR information, Spectral Database for Organic Compounds (SDBS),
http://sdbb.riondb.aist.go.jp/sdbb/cgi-bin/cre_index.cgi
Website, <http://www.rsc.org>.
Link, Library Catalogue,
<http://tinyurl.com/nsbdbp5>