Liverpool John Moores University

Title:	Advanced Chemistry
Status:	Definitive
Code:	**6050CHACAP** (118946)
Version Start Date:	01-08-2012
Owning School/Faculty:	Pharmacy & Biomolecular Sciences
Teaching School/Faculty:	Pharmacy & Biomolecular Sciences

Team	Leader
Ian Bradshaw	Y

Academic Level:	FHEQ6	**Credit Value:**	24.00	**Total Delivered Hours:**	48.00
Total Learning Hours:	240	**Private Study:**	192		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	30.000
Practical	8.000
Workshop	7.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	exam		60.0	3.00
Practice	practical		20.0	
Essay	assignment		20.0	

Aims

Advanced Chemistry course

Learning Outcomes

After completing the module the student should be able to:

1	Demonstrate an understanding of the mechanism of a range of chemical and enzymic reactions
2	Outline the strategies and procedures involved in the synthesis of a range of molecules
3	Deduce chemical principles from relevant data and structures
4	Conduct an experiment and evaluate data in a relevant advanced chemistry topic

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

closed book exam	1	2	4
practical	1		
assignment	1	2	3

Outline Syllabus

Enols & synthesis
Enols, enolate anions, enamines and their reactions: base-catalysed enolate reactions, regioselectivity: kinetic & thermodynamic control. Enolate trapping. Reactions of enolates: halogenation, alkylation. Malonic ester and ethyl acetoacetate for forming new C-C bonds. Enolate anions as ambient nucleophile. The Aldol reaction, Michael addition and Robinson annulation. Enamimes: their formation and reactions.
Introduction to disconnection approach. Retrosynthesis and disconnections of target molecules in relation to enolate alkylation, the Diels-Alder and Wittig reactions.
Biotransformations
The use of enzymes in organic synthesis. Enzyme-substrate interactions and mechanisms for catalysis. Stereo- and regio- specificity in biocatalysis. Examples and mechanisms for useful synthetic and industrial organic reactions from the following; hydrolytic, condensation c-c bond formation, redox and hydroxylations.
Enzymic QSAR
Quantitative Structure-Activity Relationships (QSAR) in enzymic systems: The Michaelis-Menten mechanism, binding interactions, general base catalysis, metal ion and nucleophilic catalysis, intramolecular processes, physicochemical descriptors for electronic, steric and hydrophobic effects, enzymic QSARs.
Heterocyclic chemistry
Heterocycles containing two or more heteroatoms: introduction to include importance and nomenclature. Revision of structures and chemistry of pyridine and pyrolle. Chemistry of diazines including (i) electrophilic attack at N & C (ii) nucleophilic substitution (iii) free radical substitution (iv) oxidation & reduction. Chemistry of the 1,3-azoles (imidazole, oxazole & thiazole) - as for diazines except (i) is electrophilic substitution.
N.B. (a) the emphasis is predicting the reactivity of these systems from a knowledge of benzene, pyridine & pyrrole chemistry (b) synthesis and physical properties are dealt with briefly. (c) important examples of these heterocyclic systems are stressed.
Organometallic Catalysis:

Homogeneous catalysis of hydrogenation, asymmetric hydrogenation, hydroformylation, isomerisation. Supported homogeneous catalysis. Interactions of pi-donor ligands with transition metals, and binary carbonyl clusters in catalysis. Photoelectron spectroscopy:
The photoionisation process and line resolution. Photon sources in UV pes. Detailed analysis of photoelectron spectra, particularly of Cl2, N2, NO, HBr, Ar, Hg and molecules with localised orbitals. Photon sources in xpes. Spectra of simple structural molecules such as NaN3, B5H9, CH3CH2COOCF2CF3, ClF3. Instrumentation in PES, including retarding grid and deflection analysers.

Learning Activities

Lectures, practicals, workshops and computer assisted learning

References

Course Material	Book
Author	Solomons, T.W.G. and Fryhle, C.B.
Publishing Year	2010
Title	Organic Chemistry
Subtitle	
Edition	10th
Publisher	Wiley
ISBN	9780470524596

Course Material	Book
Author	Hanson JR
Publishing Year	1995
Title	An Introduction to Biotransformations in Organic Chemistry
Subtitle	
Edition	
Publisher	Oxford University Press
ISBN	0-7161-4541-0

Course Material	Book
Author	Patrick, G.L.
Publishing Year	2009
Title	An introduction to medicinal chemistry
Subtitle	
Edition	4th
Publisher	Oxford University Press
ISBN	0199234477

Course Material	Website
Author	Nicholls BS

Publishing Year	
Title	ChemiCAL teaching and learning software
Subtitle	
Edition	
Publisher	Liverpool JMU
ISBN	

Notes

Advanced Chemistry Course