Imperial College London

Department of Chemistry Course Summary

Name of Course	Pericyclic Chemistry
Module Code	CHEM60001/2 Advanced Chemistry Topics 1
Year/Term of Study	Year 3, Autumn term
What you need to know before you start this course (pre-requisites)	First-year organic chemistry (from *Reactivity at Carbon Centres* CHEM40006) and second-year organic chemistry (from *Control and Selectivity in Molecular Systems* CHEM50007 and *Chemistry of Molecular Systems* CHEM50005).
Maths concepts you should revise before the start of this course	None
Aim(s) of Course	To examine a unique class of reactions known as pericyclic reactions. These synthetically important reactions proceed *via* cyclic transition states in which bonds are broken and formed in a concerted manner without the formation of an intermediate.
Course Content	***Lecture 1*** Course structure; a review of key orbital concepts; the Hückel molecular orbital model for conjugated π-systems. ***Lecture 2*** Introduction to pericyclic reactions, Historical perspective, and symmetry correlation diagrams. ***Lecture 3*** The Woodward-Hoffmann rules and approach to analysis of pericyclic reactions. ***Lecture 4*** Frontier Molecular Theory (FMO) and approach to analysis of pericyclic reactions. ***Lecture 5*** [4+2]- and [3+2]-Cycloaddition reactions – Diels Alder reactions and 1,3-dipolar cycloaddition reactions. ***Lecture 6*** [2+2]-Cycloaddition reactions, cheletropic reactions and group transfer reactions. ***Lecture 7*** Sigmatropic rearrangements – [3,3]-Cope and Claisen rearrangements; [1,n]-alkyl and hydride shifts, [2,3]-rearrangements. ***Lecture 8*** Electrocyclic reactions – ring-opening and ring-closing.

At the end of this course you should be able to (learning outcomes)	• Identify a pericyclic reaction and categorise it as a cycloaddition, a group transfer reaction, a sigmatropic rearrangement, or an electrocyclic reaction, • Apply the Woodward-Hoffmann rules to predict the viability and/or stereochemical outcomes of certain pericyclic reactions, • Apply frontier molecular orbital (FMO) theory to rationalise selectivity and reactivity aspects of pericyclic reactions.
Course delivered by (Name of lecturer)	Professor Alan C. Spivey
Number of lectures / workshops /problem classes	Eight lectures; engagement points between lecture sections; discussion in Bb discussion board; one workshops; one Face Time (drop-in) session.
Outside the timetabled slots it is expected that you	Do any suggested reading; review notes from previous lectures; attempt engagement point problems; prepare for workshops in advance.
Ways to get feedback on your work prior to assessment	Discussion in Bb discussion board; one workshop; one Face Time (drop-in) session.
This course is assessed by	January exam
Suggested texts for this course	Clayden, Greeves, Warren, Wothers (second edition)
Where else in the programme this course will be useful (pre-requisite to other courses or research)	**Year 3:** *Advanced Chemistry Topics 1 and 2* CHEM60001/2 - organic aspects thereof. **Year 4:** *Advanced Stereochemistry, Synthesis and Biosynthesis* CHEM970005.