

Subject	Year	Term
Chemistry	12	3
Topic		
4.1.3 Alkenes		
Content (Intent)		
<p>Prior Learning (Topic) Year 10 C7 organic chemistry, 2.2.2 Bonding and structure, 4.1.1 basic concepts, 4.1.2 alkanes</p>		
<p>Properties of alkenes</p> <p>(a) alkenes as unsaturated hydrocarbons containing a C=C bond comprising a π-bond (sideways overlap of adjacent p-orbitals above and below the bonding C atoms) and a σ-bond (overlap of orbitals directly between the bonding atoms) (see also 4.1.2 a); restricted rotation of the π-bond</p> <p>(b) explanation of the trigonal planar shape and bond angle around each carbon in the C=C of alkenes in terms of electron pair repulsion (see also 2.2.2 g–h, 4.1.2 b)</p> <p>Stereoisomerism in alkenes</p> <p>(c) (i) explanation of the terms:</p> <ul style="list-style-type: none"> • stereoisomers (compounds with the same structural formula but with a different arrangement in space) • E/Z isomerism (an example of stereoisomerism, in terms of restricted rotation about a double bond and the requirement for two different groups to be attached to each carbon atom of the C=C group) • cis–trans isomerism (a special case of E/Z isomerism in which two of the substituent groups attached to each carbon atom of the C=C group are the same) <p>(ii) use of Cahn–Ingold–Prelog (CIP) priority rules to identify the E and Z stereoisomers</p> <p>(d) determination of possible E/Z or cis–trans stereoisomers of an organic molecule, given its structural formula</p> <p>Addition reactions of alkenes</p> <p>(e) the reactivity of alkenes in terms of the relatively low bond enthalpy of the π-bond</p> <p>(f) addition reactions of alkenes with:</p> <ul style="list-style-type: none"> (i) hydrogen in the presence of a suitable catalyst, e.g. Ni, to form alkanes (ii) halogens to form dihaloalkanes, including the use of bromine to detect the presence of a double C=C bond as a test for unsaturation in a carbon chain (iii) hydrogen halides to form haloalkanes (iv) steam in the presence of an acid catalyst, e.g. H_3PO_4, to form alcohols <p>(g) definition and use of the term electrophile (an electron pair acceptor)</p> <p>(h) the mechanism of electrophilic addition in alkenes by heterolytic fission (see also 4.1.1 h–i)</p> <p>(i) use of Markownikoff’s rule to predict formation of a major organic product in addition reactions of H–X to unsymmetrical alkenes, e.g. H–Br to propene, in terms of the relative stabilities of carbocation intermediates in the mechanism</p> <p>Polymers from alkenes</p> <p>(j) addition polymerisation of alkenes and substituted alkenes, including:</p> <ul style="list-style-type: none"> (i) the repeat unit of an addition polymer deduced from a given monomer (ii) identification of the monomer that would produce a given section of an addition polymer <p>Waste polymers and alternatives</p> <p>(k) the benefits for sustainability of processing waste polymers by:</p> <ul style="list-style-type: none"> (i) combustion for energy production (ii) use as an organic feedstock for the production of plastics and other organic chemicals (iii) removal of toxic waste products, e.g. removal of HCl formed during disposal by combustion of halogenated plastics (e.g. PVC) <p>(l) the benefits to the environment of development of biodegradable and photodegradable polymers.</p>		

Future Learning (Topic) 4.2.1 alcohols, 5.3.1 Transition elements, 6.1.1 Aromatics, 6.2.3 Polyesters and polyamides

How will knowledge and skills be taught?
(Implementation)

How will your understanding be assessed & recorded (Impact)

Practical work

The reactions of alkenes
Making polystyrene
PAG 7
Molymods

- 1 x standard homework (grade given.
Written feedback. Response expected.)
PAG 7

Written

Explanation of stereoisomerism
Examples and use of priority rules
Explanation of electrophilic addition
including roleplay and modelling

How can parents help at home?

Look at the topic specific resources on the VLE
Use appropriate websites: MachemGuy, Allery Chemistry, Chemistry World – by Royal Society of Chemistry, ChemGuide.
Take an interest! Ask your children what they have learnt and be curious about their learning.

Helpful further reading/discussion

Reading

Text book chapter 13 p.200-221
The Science of Everyday Life
by Marty Jopson
Why Chemical Reactions
Happen by Keeler and
Wothers

Vocabulary Lists

π -bond
restricted rotation
stereoisomers
E/Z isomerism
Cahn–Ingold–Prelog
Addition
Electrophile
carbocation
Polymer
repeat unit
monomer

Careers Links

Analytical chemist
Chemical engineer
Clinical biochemist
Forensic scientist
Pharmacologist
Process chemist
Quality control analyst
Research scientist
Science writer
Site chemist
Teacher or lecturer
Degrees;
Chemistry
Biochemistry
Biomedical science
Biological sciences
Medicine
Research chemist
Veterinary medicine