Alkenes

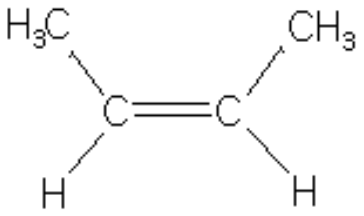
The key areas of study in this topic are:

- Properties of alkenes
- Stereoisomerism in alkenes
- Reactions of alkenes
- Managing waste

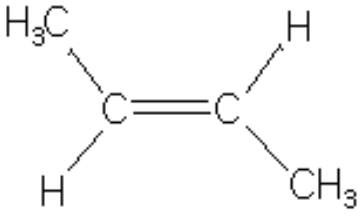
By the end of this topic I should be able to:	Start	End
Describe alkenes as unsaturated hydrocarbons containing a C=C bond comprising a π-bond (sideways overlap of adjacent p-orbitals above and below the bonding C atoms) and a σ-bond (overlap of orbitals directly between the bonding atoms)		
Understand there is restricted rotation of the π-bond		
Explain the trigonal planar shape and bond angle around each carbon in the C=C of alkenes in terms of electron pair repulsion		
Explain the terms: • 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)		
Use the Cahn–Ingold–Prelog (CIP) priority rules to identify the E and Z stereoisomers		
Determine possible E/Z or cis–trans stereoisomers of an organic molecule, given its structural formula		
Understand the reactivity of alkenes in terms of the relatively low bond enthalpy of the π bond		
Describe the addition reactions of alkenes with: • hydrogen in the presence of a suitable catalyst, e.g. Ni, to form alkanes • 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 • hydrogen halides to form haloalkanes • steam in the presence of an acid catalyst, e.g. H_3PO_4, to form alcohols		
Define and use the term electrophile (an electron pair acceptor)		

Draw the mechanism of electrophilic addition in alkenes by heterolytic fission		
Use 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		
Describe addition polymerisation of alkenes and substituted alkenes, including: • the repeat unit of an addition polymer deduced from a given monomer • identification of the monomer that would produce a given section of an addition		
Describe the benefits for sustainability of processing waste polymers by: • combustion for energy production • use as an organic feedstock for the production of plastics and other organic chemicals • removal of toxic waste products, e.g. removal of HCl formed during disposal by combustion of halogenated plastics (e.g. PVC)		
Describe the benefits to the environment of development of biodegradable and photodegradable polymers.		

In all topic areas you should be able to demonstrate and apply your knowledge and understanding.



cis-but-2-ene
Z-but-2-ene



trans-but-2-ene
E-but-2-ene