

Alkenes

Specification reference	Checklist questions	
4.1.3 a	Can you 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); with restricted rotation of the π -bond?	<input type="checkbox"/>
4.1.3 b	Can you explain the trigonal planar shape and bond angle around each carbon in the C=C of alkenes in terms of electron pair repulsion?	<input type="checkbox"/>
4.1.3 c i	Can you explain the term <i>stereoisomers</i> (compounds with the same structural formula but with a different arrangement in space)?	<input type="checkbox"/>
4.1.3 c i	Can you explain the term <i>E/Z isomerism</i> (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)?	<input type="checkbox"/>
4.1.3 c i	Can you explain the term <i>cis-trans isomerism</i> (a special case of <i>E/Z isomerism</i> in which two of the substituent groups attached to each carbon atom of the C=C group are the same)?	<input type="checkbox"/>
4.1.3 c ii	Can you use Cahn-Ingold-Prelog (CIP) priority rules to identify the <i>E</i> and <i>Z</i> stereoisomers?	<input type="checkbox"/>
4.1.3 d	Can you determine possible <i>E/Z</i> or <i>cis-trans</i> stereoisomers of an organic molecule, given its structural formula?	<input type="checkbox"/>
4.1.3 e	Can you describe the reactivity of alkenes in terms of the relatively low bond enthalpy of the π -bond?	<input type="checkbox"/>
4.1.3 f i	Can you describe addition reactions of alkenes with: hydrogen in the presence of a suitable catalyst (e.g. Ni) to form alkanes?	<input type="checkbox"/>
4.1.3 f ii	Can you describe addition reactions of alkenes with 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?	<input type="checkbox"/>
4.1.3 f iii	Can you describe addition reactions of alkenes with hydrogen halides to form haloalkanes?	<input type="checkbox"/>

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4.1.3 f iv	Can you describe addition reactions of alkenes with steam in the presence of an acid catalyst (e.g. H_3PO_4) to form alcohols?	<input type="checkbox"/>
4.1.3 g	Can you define and use the term <i>electrophile</i> (an electron pair acceptor)?	<input type="checkbox"/>
4.1.3 h	Can you explain the mechanism of electrophilic addition in alkenes by heterolytic fission?	<input type="checkbox"/>
4.1.3 i	Can you 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?	<input type="checkbox"/>
4.1.3 j i	Can you describe addition polymerisation of alkenes and substituted alkenes, including the repeat unit of an addition polymer deduced from a given monomer?	<input type="checkbox"/>
4.1.3 j ii	Can you describe addition polymerisation of alkenes and substituted alkenes, including identification of the monomer that would produce a given section of an addition polymer?	<input type="checkbox"/>
4.1.3 k i	Can you list and describe the benefits for sustainability of processing waste polymers by combustion for energy production?	<input type="checkbox"/>
4.1.3 k ii	Can you list and describe the benefits for sustainability of processing waste polymers by use as an organic feedstock for the production of plastics and other organic chemicals?	<input type="checkbox"/>
4.1.3 k iii	Can you list and describe the benefits for sustainability of processing waste polymers by removal of toxic waste products formed during disposal by combustion of halogenated plastics (e.g. PVC)?	<input type="checkbox"/>
4.1.3 l	Can you list and describe benefits to the environment of development of biodegradable and photodegradable polymers?	<input type="checkbox"/>