OCR (A) Chemistry A-level

Topic 4.1.3 - Alkenes

Flashcards

What are alkenes?

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Unsaturated hydrocarbons that contain at least one C=C bond made up of a π bond and a σ bond

What is the general formula of alkenes?

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C_nH_{2n}

How is a π bond formed?

How is a π bond formed?

Electrons in the adjacent p orbitals overlap above and below the carbon atoms. They can only be made after a σ bond is formed

What bond restricts the rotation of carbon atoms?

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π bond

What is the angle and shape of a double bond?

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Trigonal planar

120°

Are they more or less reactive than alkanes? Why?

Are they more or less reactive than alkanes? Why?

More reactive due to high electron density of double bond and the fact the pi-bond is slightly easier to break

What intermolecular forces of attraction do they have?

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Only London forces due to non-polar bonds

Are they soluble in water? Why?

Are they soluble in water? Why?

No, non-polar bonds

Write an equation for the complete combustion of pent-2-ene

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$$CH_3CH{=}CHCH_2CH_3 + 7½O_2 \rightarrow 5CO_2 + 5H_2O$$

What are the types of isomers that can be formed using alkenes?

What are the types of isomers that can be formed using alkenes?

E/Z isomers - due to the restricted rotation

Cis-trans isomers - if two of the same substituents are attached to each carbon

What is an electrophile?

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Species that are electron pair acceptors

What is the most stable type of carbocation intermediate? Why?

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Alkyl groups have a positive inductive effect, so the most stable carbocation is the one bonded to the most other carbon atoms i.e. A tertiary carbocation

Major products will be formed from which kinds of carbocations?

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Tertiary (or the most stable available)

What conditions are needed for the electrophilic addition of H_2O to an alkene? What is this type of reaction called?

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Steam in the presence of an acid catalyst, usually phosphoric acid

Reaction is called hydration

What are the product(s) of the hydration reaction?

What are the product(s) of the hydration reaction?

An alcohol

Draw a mechanism for the addition of water to ethene

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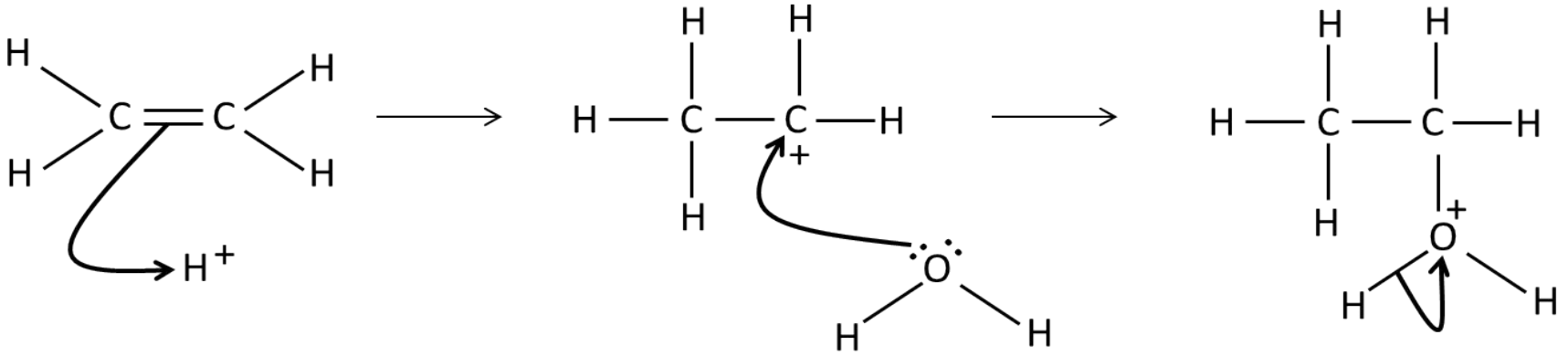

What conditions are needed for the electrophilic addition of a hydrogen halide to an alkene?

What conditions are needed for the electrophilic addition of a hydrogen halide to an alkene?

Hydrogen halide gases must be at room temperature

Draw a mechanism for the reaction of HBr and ethene

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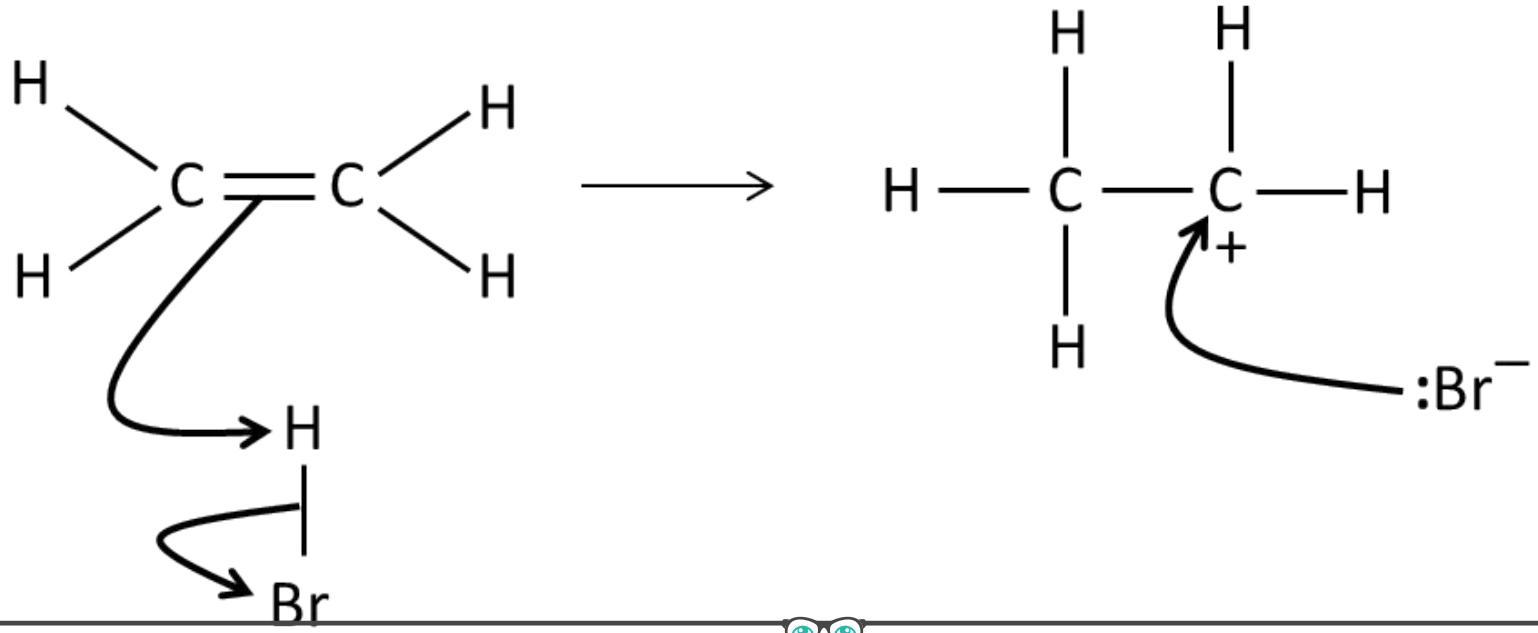

What is the reaction called when a halogen is added to alkene?

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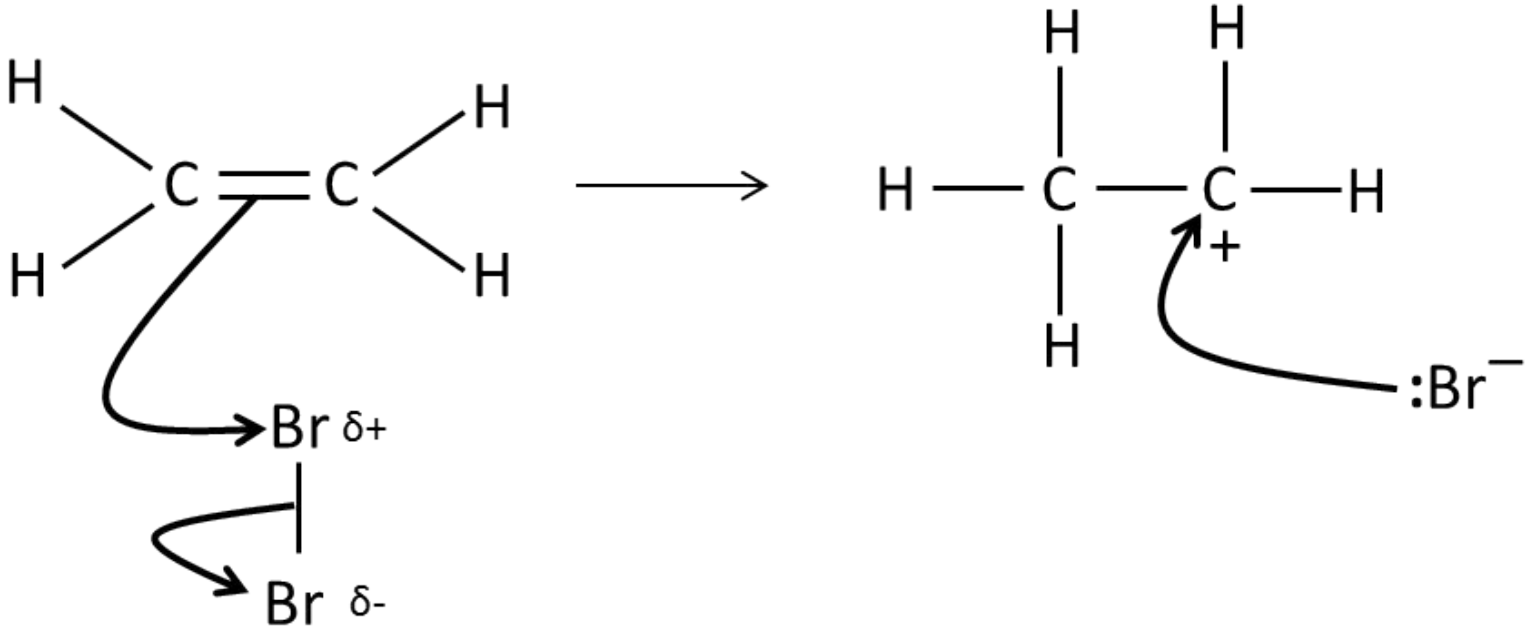
Halogenation

How does a molecule with a non-polar bond react as if it is an electrophile?

C=C double bond with a high electron density induces a temporary dipole in the halogen molecule → δ+ atom attracted to double bond

Draw a mechanism for the reaction between bromine and ethene

Draw a mechanism for the reaction between bromine and ethene



How can an alkene be converted into alkane? What is the reaction called and what are the required conditions?

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Alkene + hydrogen = Alkane

Hydrogenation

Conditions → 150°C, nickel catalyst

What is an addition polymer?

What is an addition polymer?

Many monomers bonded together via rearrangement of bonds without the loss of any atom or molecule

What are monomers? What form do they usually take?

What are monomers? What form do they usually take?

Molecules which combine to form a polymer

Usually have a C=C bond which breaks to leave a repeating pattern

Draw how you would represent the polymerisation of ethene

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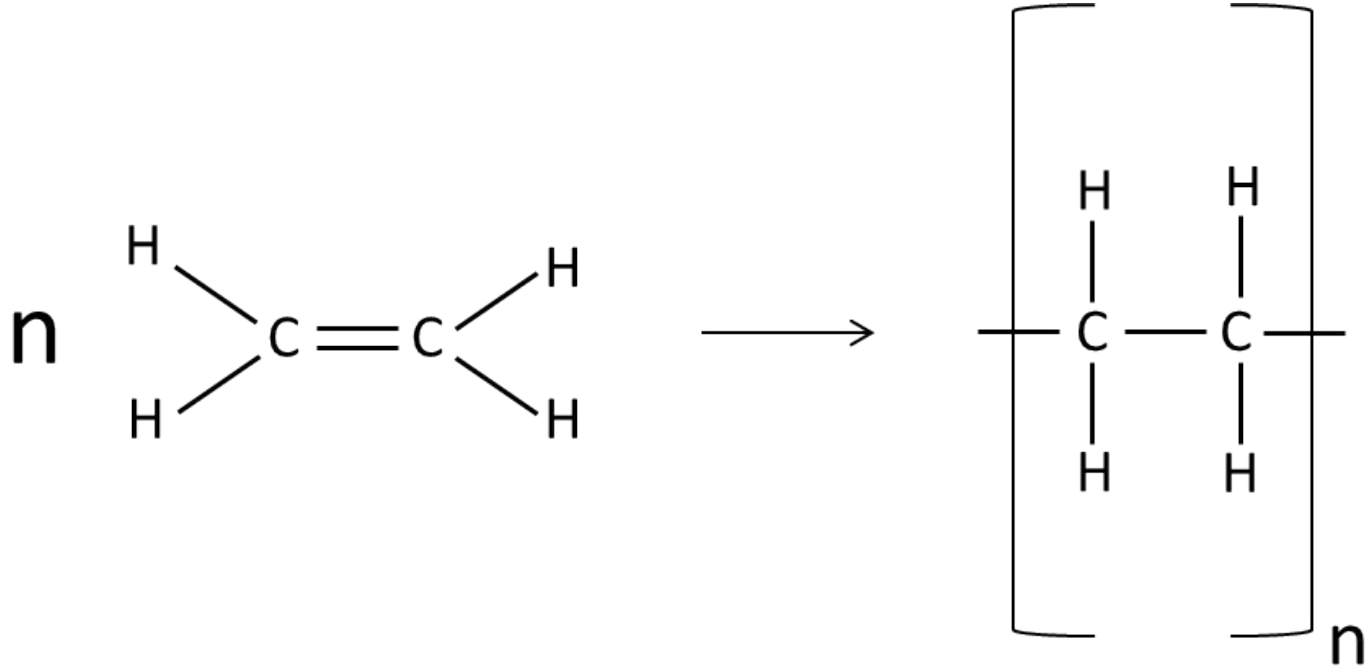

What are the ways in which plastics can be disposed? (6)

What are the ways in which plastics can be disposed?

- Landfill
- Combustion
- Electricity generation
- Reuse
- Recycle
- Organic feedstock

What are the disadvantages of recycling?

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- Plastics must be sorted into different types
- Expensive
- Labour intensive
- Requires high technology

How does photodegradable polymers break down?

How does photodegradable polymers break down?

They are broken down chemically using energy with wavelengths similar to light. Once the break down begins it is not possible to stop the process

Explain what happens in organic feedstock

Explain what happens in organic feedstock

Plastics are separated and broken down into small organic molecules through a series of reaction. The molecules can then be used produce plastics and in other industries

Give a disadvantage of photodegradable polymers

Give a disadvantage of photodegradable polymers

May not be exposed to sufficient light