

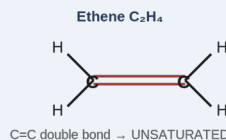
# 4.4 Alkenes

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## 1. KEY VOCABULARY

TERM	MEANING
Alkene	An unsaturated hydrocarbon with a C=C double bond.
Unsaturated	Contains at least one C=C double bond.
Addition reaction	A reaction where atoms add across the C=C double bond.
Cracking	Breaking long alkanes into shorter alkanes and alkenes.
Monomer	A small molecule that joins to make a polymer.

## 2. STRUCTURE & THE TEST



### TEST FOR ALKENES:

Shake with bromine water.  
 Alkene → orange decolourises to colourless.  
 Alkane → stays orange.

Alkenes: general formula C<sub>n</sub>H<sub>2n</sub> — have a C=C double bond.

The double bond makes them reactive — they undergo ADDITION reactions.

Made by cracking long-chain alkanes; used to make polymers.

## 3. THE FIRST ALKENES

NAME	FORMULA
Ethene	C <sub>2</sub> H <sub>4</sub>
Propene	C <sub>3</sub> H <sub>6</sub>
Butene	C <sub>4</sub> H <sub>8</sub>

## 4. ADDITION REACTIONS

The C=C double bond opens up and atoms add across it.

**+ bromine:** orange bromine water is decolourised — this is the test for an alkene.

**+ hydrogen:** forms the alkane (with a nickel catalyst).

## 5. HOW ALKENES ARE MADE & USED

**Made by cracking** long-chain alkanes from crude oil.

**Used to make polymers** (addition polymerisation) and other chemicals such as ethanol.

## 6. THE WHY

**Why alkenes are more reactive than alkanes:** the C=C double bond is a region of high electron density that other molecules are attracted to.

**Why bromine water decolourises:** bromine adds across the C=C double bond, so the orange colour is used up.

## 7. COMMON EXAM MISTAKES

- ✗ "Alkenes have the general formula C<sub>n</sub>H<sub>2n</sub>+2."
- ✓ Alkenes are C<sub>n</sub>H<sub>2n</sub>; alkanes are C<sub>n</sub>H<sub>2n</sub>+2.
- ✗ "Bromine water turns orange with an alkene."
- ✓ It turns FROM orange TO colourless (decolourises).
- ✗ "Alkenes undergo substitution reactions."
- ✓ Alkenes undergo ADDITION reactions.

## 8. SELF-CHECK · cover & quiz

Can you...

- State the general formula and key feature of alkenes?
- Describe the test for an alkene and its result?
- Explain what an addition reaction is?
- Describe the reaction of ethene with bromine and with hydrogen?
- Explain how alkenes are made and what they are used for?
- Explain why alkenes are more reactive than alkanes?