Alkenes: structures and unsaturation

Student activity • observation and reasoning

YEAR 11 / LESSON 92 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

The question

Where is the double bond and what does it change?

Build the first acyclic alkenes, count valencies and distinguish position isomers. Test the limits of a general formula.

Equipment

• Booklet, pencil, periodic table and optional molecular model kit

Desk activity only; keep small model pieces away from mouths.

Course coverage: Shared core: 4.23–4.26. Acyclic alkenes with one C=C; displayed structures through four carbons.

Plan, model or apparatus sketch

Draw a labelled structure or model to explain your reasoning for this lesson.

Method and reasoning

Read the whole sequence before starting

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1. Draw ethene with all bonds and hydrogens shown. Count four bonds around each carbon.

2. Draw propene, but-1-ene and but-2-ene; number from the end nearest the double bond.

3. Compare C_2H_4, C_3H_6 and C_4H_8 to obtain C_nH_{2n} for this restricted family.

4. Explain unsaturated using the carbon–carbon double bond, not the number of hydrogens alone.

5. Compare cyclobutane C_4H_8 with but-1-ene. Draw the ring to show why formula alone cannot establish an alkene.

6. Swap displayed drawings with a partner and correct carbon valency and bond-position errors.

Cleanup

- Return shared equipment and retain corrected reasoning.

Record your evidence

Blank spaces are for your own work

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Reference and task data

The formula C_nH_{2n} applies here to open-chain molecules containing one C=C and no rings. Ethene is $CH_2=CH_2$; but-1-ene is $CH_2=CHCH_2CH_3$; but-2-ene is $CH_3CH=CHCH_3$. Ring example is a boundary check, not an additional naming requirement.

Task	My structure / working	Reason / correction
Ethene / propene		
Butene positions		
Formula limitation		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Give ethene’s molecular formula.

2. Draw propene fully displayed.

3. Why does an ordinary alkene need at least two carbons?

4. How do the two straight-chain butenes differ?

5. Define unsaturated in this context.

6. Does C_4H_8 alone prove a C=C bond?