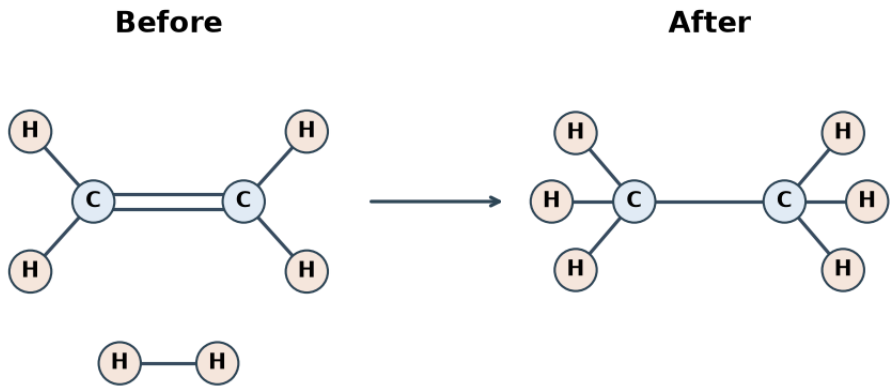
Redrawing Carbon Bonds After Hydrogen Addition

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

A simulation models a reaction between ethene and hydrogen. Each circle is an atom and each line is a bond. The separate pair of hydrogen atoms on the left is one H_2 molecule. The model contains all the atoms before and after the reaction.



Atom connections before and after the reaction.

1 Count the carbon and hydrogen atoms on both sides. Include the separate molecule on the left. [1]

Answer and work

2 Which change to the carbon bonds is shown in the diagram?

(1) The carbon-carbon bond changes from double to single.

(2) The carbon-carbon bond changes from single to triple.

(3) The two carbons become separate, unbonded atoms.

(4) Each carbon loses one attached hydrogen.

A detector checks the product after the separate H_2 molecule has disappeared. It reports that each carbon has three attached hydrogen atoms. A student copies the product with those six hydrogens but keeps a double carbon-carbon bond.

3 Explain why the student's drawing gives the wrong number of shared electron pairs around each carbon. Describe the correction that keeps all six hydrogens. [1]

Answer and work

4 In a later trial the detector still reports a separate H_2 molecule as well as some product. Explain why the original before-and-after atom counts would not reveal this incomplete reaction. [1]

Answer and work