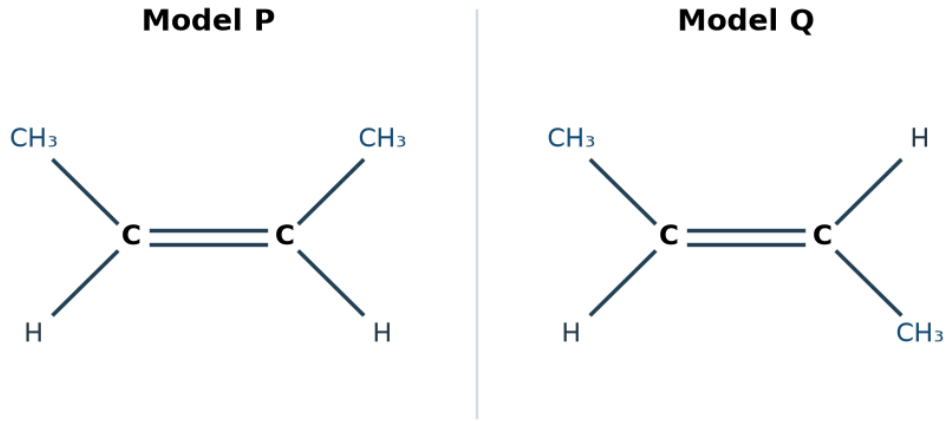
Reading the Two Sides of a Double Bond

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

A molecular display shows two models of butene. Each CH_3 label represents one carbon and three hydrogens. Each C at the center has one H and one CH_3 attached. The central double bond prevents the two ends from turning independently in this model.



Two models of the groups attached to a double bond.

1 Which statement distinguishes the two models?

(1) P has more carbon atoms than Q.

(2) Q has a single central bond.

(3) The CH_3 groups are on the same side in P and opposite sides in Q.

(4) Only P has an H attached to each central carbon.

2 Find the molecular formula of each model. Show how the CH_3 groups and separate H labels are counted. [1]

Answer and work

3 A student turns the entire P drawing 180° in the plane of the page. Explain whether this can make the two CH_3 groups appear on opposite sides of the double bond. [1]

Answer and work

A student builds a different model in which the central bond is single and one additional H is attached to each central carbon. The two ends can now turn relative to one another.

4 Explain why an observation of the CH_3 groups on opposite sides in the single-bond model does not require a different fixed arrangement of the atoms. [1]

Answer and work