Counting Replacement Sites in Carbon Models

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 C_5H_{12} models. In both, carbon forms four bonds and hydrogen forms one. The display can replace one H with Cl. It counts different connections between atoms and ignores any differences that depend only on viewing orientation.

Model	**Carbon-to-carbon connections**
P	A–B, B–C, C–D, D–E
Q	A–B, A–C, A–D, A–E

1 Which carbon in model Q has no hydrogen attached?

(1) A

(2) B

(3) C

(4) E

2 Check the 12 hydrogen atoms in P by counting how many attach to its two end carbons and to its three inside carbons. [1]

Answer and work

In P, flipping the chain end for end interchanges A with E and B with D. In Q, rotating the model can interchange any of the four outer carbons with any other outer carbon.

3 Compare how many different atom connections the one-H replacement can make in P and Q. Identify the different positions in P. [1]

Answer and work

4 Draw a structure for model P in which Cl replaces one H attached to an inside carbon. Show the five carbon atoms and the bond to Cl. You may omit the other H atoms. [1]

Draw your model