Drawing Two Places for Oxygen in a Chain

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

A molecule display shows three models with the same atom counts. It can erase one bond at a time and count the carbon atoms on the two separated pieces. This is a bond-model exercise. The first setting erases one bond between C and O. In each formula a dash shows a single bond, and parentheses show a branch attached to the preceding carbon.

Model	**Condensed formula**
P	CH_3–CH_2–CH_2–O–H
Q	CH_3–O–CH_2–CH_3
R	CH_3–CH(O–H)–CH_3

1 For P and R, give the carbon count in each of the two pieces after erasing the C–O bond. Explain why this result cannot distinguish the two models. [1]

Answer and work

2 Which model can yield a one-carbon piece and a two-carbon piece when the first setting erases a single C–O bond?

(1) P only

(2) Q only

(3) R only

(4) P and R only

The first setting leaves a zero-carbon piece and a three-carbon piece from an unknown that matches one of the three models. On a fresh copy, a second setting erases one C–C bond next to the carbon bonded to oxygen. It gives a one-carbon piece that still holds O and a two-carbon piece without O.

3 Identify the unknown. Explain what each of the two settings rules out. [1]

Answer and work

4 Draw the carbon skeleton of R, including its attached O. Mark one bond the second setting could erase and give the carbon count of the piece that still contains O. [1]

Draw and label the atoms and bonds