Comparing Molecular Representations

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

A molecular formula gives the kinds and numbers of atoms. A structural representation also shows which atoms are bonded.

1 What information is given directly by the molecular formula C_2H_6O?

(1) The positions of all atoms in space

(2) Two C atoms, six H atoms, and one O atom per molecule

(3) A bond angle of exactly 90°

(4) The identity of every pair of bonded atoms

2 Explain what the lines in H–O–H show that the molecular formula H_2O does not show by itself. [1]

Answer and work

3 Which representation explicitly shows both oxygen atoms bonded to the same carbon atom?

(1) CO_2 alone

(2) $2CO_2$

(3) O=C=O

(4) C + O_2 without a structure

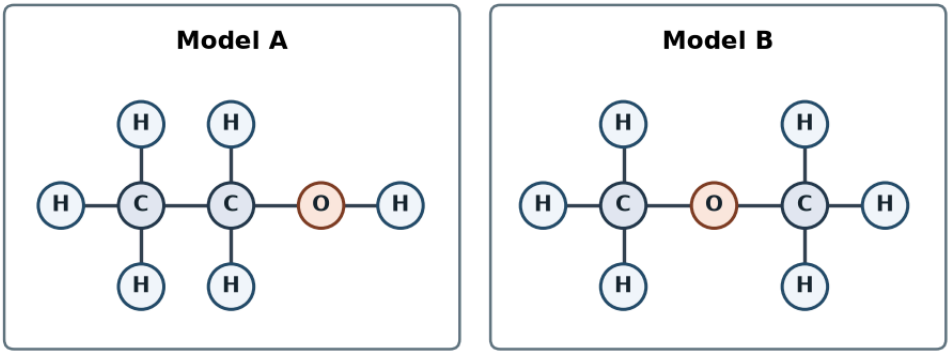
4 A flat structural diagram shows the correct connections in a molecule. Explain why it may be insufficient to determine the molecule’s three-dimensional shape. [1]

Answer and work

Two Models with the Same Atom Counts

Use the information below to answer the questions.

The diagrams show which atoms are joined in two molecular models. A line represents a single covalent bond. Count all of the labeled atoms in each panel.



Two different arrangements of carbon, hydrogen, and oxygen atoms.

5 Which molecular formula matches both models?

(1) CH_3O

(2) C_2H_6O

(3) C_2H_4O

(4) C_3H_6O

6 Which model contains an O–H bond? Explain using the connections in the diagram. [1]

Answer and work

7 How many hydrogen atoms are attached directly to oxygen in model B?

(1) 0

(2) 1

(3) 2

(4) 3

8 Explain why the shared molecular formula is insufficient to decide which model shows the C–O–C connection. [1]

Answer and work