Counting Oxygen Atoms in an Ozone Model

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

A classroom atmosphere model compares ordinary oxygen, O_2, and ozone, O_3. An O_2 molecule has two atoms on a line. An O_3 molecule has three atoms in a bent arrangement. The simulation models the overall rearrangement of oxygen atoms as shown in the equation.

$3O_2(g) \rightarrow 2O_3(g)$

1 Which description correctly compares the molecules before and after the rearrangement?

(1) O_2 and O_3 contain different elements.

(2) O_2 is bent, and O_3 is a straight two-atom molecule.

(3) Both contain only oxygen, but O_3 has a bent three-atom arrangement.

(4) O_2 and O_3 have the same number of atoms per molecule.

2 Calculate the total number of oxygen atoms represented on each side of the equation. Explain how the coefficients and subscripts work together. [1]

Answer and work

A sealed simulation starts with 12 O_2 molecules. After the rearrangement its meter reports 11 molecules, but it does not identify their shapes. A student proposes two particle drawings for that reading.

Drawing	**O_2 molecules**	**O_3 molecules**
U	9	2
V	10	1

3 Which proposed drawing can represent the sealed simulation? Compare the number of oxygen atoms in each drawing with the original count. [1]

Answer and work

4 A second instrument detects two separate bent groups, each with three joined oxygen atoms. Explain how this extra evidence distinguishes the drawings. [1]

Answer and work