

Math Diversion Problem 903

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Learning is a treasure that will follow its owner everywhere.

— Chinese proverb

Source: http://msmorrischemistry.weebly.com/uploads/3/8/9/5/38951057/stoichiometry__ap_mc_.pdf

Title: Moles of H₂O from Burning Alkene: Problem 45

Presenter: Patrick

Definitions:

FW = Formula weight = molar mass

ppt = precipitate

At wt = atomic weight

1 Problem

The alkenes are compounds of carbon and hydrogen with the general formula C_nH_{2n}. If 0.561 gram of any alkene is burned in excess oxygen, what number of moles of H₂O is formed?

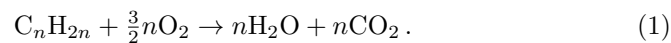
- (A) 0.0400 mole (B) 0.0600 mole (C) 0.0800 mole
(D) 0.400 mole (E) 0.800 mole

Ans: (A).

2 Solution

Step 1.

I'll begin with a presumptive balanced chemical equation for the reaction:



Step 2. First, what's the grams/mole of C_nH_{2n}? It's *n* times the grams/mole of the logical compound CH₂, which equals $n(12.01 + 2.02) = 14.03n$ [g·mol⁻¹].

Next, a diagram:

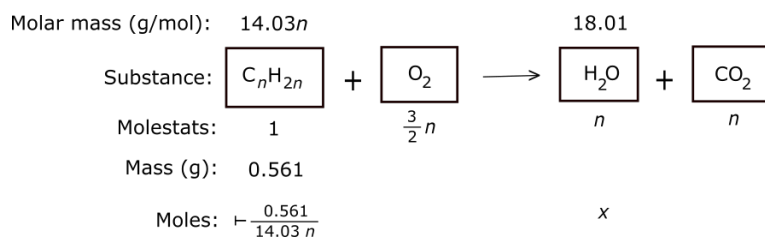


Figure 1. This sparse figure depicts the presumptive balanced equation for the burning of a general alkene in excess oxygen.

Step 3. Apply the stoichiometric proportion

All we need is the ratio of x to y , and we can use our stoichiometric proportion between columns 1 and 3:

$$\frac{n}{1} = \frac{x}{0.561/14.03n} \text{ mol.} \quad (2)$$

On solving for x , we get (after rounding up)

$$x = 0.0400 \text{ mol.} \quad (3)$$

3 Appendix: How to interpret the Stoich diagrams

There are four main types of data in the stoich diagrams I make. The most common are data from given information, from the coefficients of the balanced equation, and from data tables, such as a periodic table of elements for molar mass information. This kind of data I do not mark up. The second kind of data in stoich diagrams comes from computations based on data in the same column, for which I use the turnstile (↳) to indicate. The third kind of data is a result in one column that required data from at least one other column to calculate it, and I indicate that kind of value or result by use of the underlining. The fourth kind of data in the figures is the result of combining given information to derive a secondary value. I indicate this kind of data with a right arrowhead (▶).