South Pasadena • AP Chemistry

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Period __ Date __/__/__

4 • Chemical Equations and Stoichiometry

COMBUSTION EQUATIONS

For burning to occur, you need a fuel, an oxidizer, and heat. When hydrocarbons are the fuel and O_2 in the air is the oxidizer, then CO_2 and H_2O are the products.

Example: Write the balanced equation for the complete combustion of propane, C_3H_8, in air.

Solution: First, set up the basic equation. You memorize the "+ O_2 → CO_2 + H_2O" part.

$$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$$

Next, balance. 3 C's in C_3H_8 result in $3CO_2$'s; 8 H's in C_3H_8 result in 4 H_2O's;

$$C_3H_8 + \_\_ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$$

Total O's on the product side = 10 [(3 x 2) + (4 x 1)] = total O's on the reactant side.

This would mean that 5 O_2's were involved.

Tip: If an UNEVEN number of O's need to be represented, a fraction should be used. 7 O's = $^7/_2\ O_2$

Tip: Take into account fuels that contain oxygen. Subtract the O's from that represented as O_2's

Practice: Write the balanced combustion equations for the following substances.

1. CH_4 $+2O_2 \rightarrow CO_2 + 2H_2O$
2. C_5H_{12} $+8\ O_2 \rightarrow 5CO_2 + 6H_2O$
3. C_9H_{20} $+14\ O_2 \rightarrow 9CO_2 + 10\ H_2O$
4. C_2H_6 $+\frac{7}{2}O_2 \rightarrow 2\ CO_2 + 3\ H_2O$ or 2, 7, 4, 6
5. C_8H_{18} $+\frac{25}{2}O_2 \rightarrow 8CO_2 + 9\ H_2O$ or 2, 25, 16, 18
6. C_4H_{10} $+\frac{13}{2}O_2 \rightarrow 4\ CO_2 + 5H_2O$ or 2, 13, 8, 10
7. C_2H_5OH $+3O_2 \rightarrow 2CO_2 + 3H_2O$
8. C_3H_7OH $+\frac{9}{2}O_2 \rightarrow 3CO_2 + 4H_2O$ or 2, 9, 6, 8
9. $HC_2H_3O_2$ $+2O_2 \rightarrow 2CO_2 + 2H_2O$
10. CH_3COCH_3 $+4O_2 \rightarrow 3CO_2 + 3\ H_2O$