ChemQuest 42

Moles and Reactions

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hour: \_\_\_\_\_

**Information**: Mole Ratios in Equations

Propane is burned in many rural homes for heat in the winter. Below is the balanced equation for the combustion of propane (C3H8).

C3H8 + 5 O2 🡪 3 CO2 + 4 H2O

For each molecule of propane that is burned, there needs to be five molecules of oxygen present. Likewise, if there were a dozen molecules of propane, five dozen molecules of oxygen would be required. Similarly, for each **mole** of propane, five **moles** of oxygen are needed. Also, for each mole of propane burned three moles of carbon dioxide and 4 moles of water are produced. **The numbers of moles of each substance in a chemical equation are related by the ratio of the coefficients of each substance.**

**Critical Thinking Questions**

Note: For questions 1-6, refer to the balanced equation for the combustion of propane.

1. a) How many moles of water are produced when 1.45 moles of propane are combusted?

b) How many molecules of water is this? (Remember each mole has 6.02x1023 molecules.)

1. If 2.35 moles of CO2 are produced in a reaction, how many moles of H2O would be produced?
2. Why is this statement false: “If 10 grams of propane burn, you need 50 grams of oxygen.”
3. a) If 27.3 moles of carbon dioxide are produced during the combustion of a certain amount of propane, how many moles of propane were combusted?

b) How many grams of propane was this?

1. If you have 410 grams of propane and want to know how many grams of oxygen are required to burn it, you can follow these steps…
2. Find the number of moles of propane that you have. Convert grams to moles!
3. The moles of propane are related to the moles of oxygen by the ratio of coefficients in the balanced chemical equation. Find the number of moles of oxygen you need given the moles of propane from part a.
4. Find the grams of oxygen from the moles of oxygen. Convert the moles of oxygen (answer to part b) to grams of oxygen (O2)! (Note: use the molar mass for O2, not just O. You should get approximately 1490 g of oxygen.)
5. Verify that this statement is correct: If 315 grams of propane combusts, then approximately 515 grams of water are produced.
6. Consider the decomposition of ammonia: 2 NH3 🡪 3 H2 + N2. If you start with 425 g of NH3, how many grams of H2 and N2 can be produced?