

## CHEMISTRY PROBLEMS: STOICHIOMETRY

Quantitative problems of the kind that chemists do also arise in more familiar situations. The following problems are based on this recipe:

### PEANUT BRITTLE

1/2 cup Corn syrup (light)  
 1/2 cup Water  
 1.5 cup Peanuts  
 1.5 cup Sugar

Mix ingredients in casserole dish and microwave for 5 min. Stir. Microwave for 14 min. more. Remove from microwave. Add 1 tsp. baking soda, 1 tsp. vanilla, 1 tbsp. butter. Stir and pour on greased cookie sheet to cool. Serves 8.

In the following problems, assume that ample supplies of baking soda, vanilla, and butter are always available, and that the supply of water is essentially unlimited.

1. In order to make enough peanut brittle to serve 20, how much corn syrup is needed? How much peanuts?
2. If I have 12 cups of peanuts to use up, how much peanut brittle can I make? How much corn syrup and how much sugar will I use?
3. The local school wants to make lots of peanut brittle for an all-day fair. If they buy a gallon of peanuts, how much sugar do they need? How much corn syrup? If there are 16 cups in a gallon, how many servings of peanut brittle can they make?
4. If I have 4 cups of peanuts, 3 cups of corn syrup, and lots of sugar on hand, how much peanut brittle can I make? Which ingredient will be used up first? (Chemists call this ingredient the "limiting reactant.") How much of the other principal ingredient will be left over?
5. If I have a liter of corn syrup and 2 L of sugar, which ingredient will be used up first in this recipe? What quantity of peanuts will be used up?
6. If 1 mole of carbon burns completely in air, how much CO<sub>2</sub> will be formed?
7. Potassium chlorate is heated until oxygen is given off, according to the reaction
 
$$2 \text{KClO}_3 \longrightarrow 2 \text{KCl} + 3 \text{O}_2$$
  - (a) If we start with 50 g of potassium chlorate, how much oxygen can we get?
  - (b) If we want to produce 10 g of oxygen, how much potassium chlorate do we need to start with?
8. Hydrochloric acid is dropped on marble chips, and the following reaction takes place:
 
$$2 \text{HCl} + \text{CaCO}_3 \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$$
  - (a) If we use 150 g of marble chips, how much CO<sub>2</sub> will we get? How much CaCl<sub>2</sub>?
  - (b) If we have 600 ml of a 1.2 M solution of acid, how much marble can we decompose? How much CO<sub>2</sub> will be released in this case?