Stoichiometry in Real Life

**Ingredients**

* 1 cup butter, softened
* 1 cup white sugar
* 1 cup packed brown sugar
* ½ cup eggs
* 1/25 cup vanilla extract
* 3 cups all-purpose flour
* 1/50 cup baking soda
* 1/25 hot water
* 1/ 200 cup salt
* 2 cups semisweet chocolate chips

**Directions**

1. Preheat oven to 350 degrees F (175 degrees C).
2. Cream together the butter, white sugar, and brown sugar until smooth. Beat in the eggs one at a time, then stir in the vanilla. Dissolve baking soda in hot water. Add to batter along with salt. Stir in flour, chocolate chips, and nuts. Drop by large spoonfuls onto ungreased pans.
3. Bake for about 10 minutes in the preheated oven, or until edges are nicely browned.

Butter: C4H8O2

White Sugar: C12H22O11

Brown sugar: C12H22O11

Egg: C6H8N2O4

Vanilla extract: C8H8O3

Flour: C6H10O5

Baking soda: NaHCO3

Water: H2O

Salt: NaCl

Chocolate: [C](http://en.wikipedia.org/wiki/Carbon)7[H](http://en.wikipedia.org/wiki/Hydrogen)8[N](http://en.wikipedia.org/wiki/Nitrogen)4[O](http://en.wikipedia.org/wiki/Oxygen)2

If I want to make 2 kg of cookies how many batches do I need to make?

Gasoline Stoichiometry

Formula: 2C8H18 + 25 O2--> 16 CO2 + 18 H2O density .74 g/ml

Gas prices are currently 1.24 cents per liter. And I have a 60 L tank on my car. I get about 8 L to 100Km with my car.

According to the above formula:

* + 1. How many moles of gasoline can fit into my car?
    2. How many moles of carbon dioxide will I make with one tank of gas?
    3. What volume will this CO2 occupy?
    4. What volume of O2 will I use?

What mass of CO2 will be produced from 1 L of gasoline?

If we know that the USA uses 1.3x109 L of gas per day, what mass of CO2 is produced each day?

What mass is released per year?

The current mass of CO2 in our atmosphere is estimated at: 3.16x1015 kg!! By what percent is this number growing per year if we just account for the amount of CO2 that the USA releases per year?

Check your Understanding

1. Given the following equation: 2 C4H10 + 13 O2 ---> 8 CO2 + 10 H2O, show what the following

molar ratios should be.

a. C4H10 / O2

b. O2 / CO2

c. O2 / H2O

d. C4H10 / CO2

e. C4H10 / H2O

2. Given the following equation: 2 KClO3 ---> 2 KCl + 3 O2

a. How many moles of O2 can be produced by letting 12.00 moles of KClO3 react?

3. Given the following equation: 2 K + Cl2 ---> 2 KCl

a. How many grams of KCl is produced from 2.50 g of K and excess Cl2 ?

b. How many grams of KCl is produced from 1.00 g of Cl2 and excess K ?

4. Given the following equation: Na2O + H2O ---> 2 NaOH

a. How many grams of NaOH is produced from 1.20 x 102 grams of Na2O?

b How many grams of Na2O are required to produce 1.60 x 102 grams of NaOH?

5. Given the following equation: 8 Fe + S8 ---> 8 FeS

a. What mass of iron is needed to react with 16.0 grams of sulfur?

b. How many grams of FeS are produced?

\*For all of these problems, assume that the reactions are being performed at a pressure of 1.0 atm and a temperature of 298 K.

6. Calcium carbonate decomposes at high temperatures to form carbon dioxide and calcium oxide. How many grams of calcium carbonate will I need to form 3.45 liters of carbon dioxide?

7. Ethylene(C2H4) burns in oxygen to form carbon dioxide and water vapor:

How many liters of water can be formed if 1.25 liters of ethylene are consumed in this reaction?

8. When chlorine is added to acetylene, 1,1,2,2-tetrachloroethane is formed:

2 Cl2(g) + C2H2(g)‡ C2H2Cl4(l)

How many liters of chlorine will be needed to make 75.0 grams of C2H2Cl4?