

# Chemical Relationship

using factor label

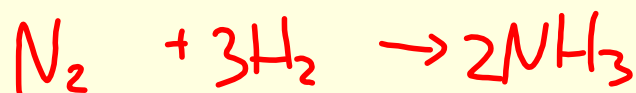
# Chocolate Chip Cookies

2 1/4 c. flour	3/4 c. brown sugar
1 tsp. baking soda	1 tsp vanilla extract
1 tsp. salt	2 eggs
1 c. butter	2 c. chocolate chips
3/4 c. sugar	

Makes 5 dozen cookies

I have 5 cups of sugar. How many cookies can I make?

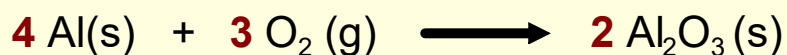
$$\begin{array}{r|l}
 5 \text{ c. sugar} & 5 \text{ dz cookies} \\
 \hline
 & 0.75 \text{ c. sugar} \quad | \quad 1 \text{ dz cookies}
 \end{array}
 = 400 \text{ cookies}$$



$$\begin{array}{r|l}
 500 N_2 & 2 NH_3 \\
 \hline
 & 1 N_2
 \end{array}
 = 1000 NH_3$$

## Chemical Relationships

The coefficients are proportional in chemical reactions



show work!

If 12 atoms of Al are available to react,

use coefficients

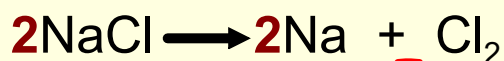
How many oxygen molecules will I need?

$$\frac{12 \text{ Al}}{4 \text{ Al}} \Bigg| \frac{3 \text{ O}_2}{2 \text{ Al}_2\text{O}_3} = 9 \text{ O}_2$$

And how many  $\text{Al}_2\text{O}_3$  will be produced?

$$\frac{12 \text{ Al}}{4 \text{ Al}} \Bigg| \frac{2 \text{ Al}_2\text{O}_3}{2 \text{ Al}_2\text{O}_3} = 6 \text{ Al}_2\text{O}_3$$

NaCl decomposes to elements



If 324 Na atoms are produced,

how many  $\text{Cl}_2$  are produced?

$$\frac{324 \text{ Na}}{2 \text{ Na}} \Bigg| \frac{1 \text{ Cl}_2}{2 \text{ NaCl}} = 162 \text{ Cl}_2$$

and how many NaCl were decomposed?

$$\frac{324 \text{ Na}}{2 \text{ Na}} \Bigg| \frac{2 \text{ NaCl}}{2 \text{ Na}} = 324 \text{ NaCl}$$

## Use Periodic Table for Conversion

show work!

What is the mass of each?

$$\begin{array}{r|l} 43 \text{ Fe} & 55.8 \text{ amu} \\ \hline & 1 \text{ Fe} \end{array} = 2399.4 \text{ amu}$$

↑

2400 amu

$$\begin{array}{r|l} 27 \text{ O}_2 & 32.0 \text{ amu} \\ \hline & 1 \text{ O}_2 \end{array} = 864 \text{ amu}$$

860 amu

Al	2 · 27 = 54	548 Al <sub>2</sub> O <sub>3</sub>		102 amu	=	55896
O	3 · 16 = 48			1 Al <sub>2</sub> O <sub>3</sub>		↑
1 Al <sub>2</sub> O <sub>3</sub> = 102 amu						55900 amu

If there are 816 amu Al<sub>2</sub>O<sub>3</sub>, how many molecules are there?

$$\begin{array}{r|l} 816 \text{ amu} & 1 \text{ Al}_2\text{O}_3 \\ \hline & 102 \text{ amu} \end{array} = 8 \text{ Al}_2\text{O}_3$$



What is the mass of 642 atoms of  $\text{C}_8\text{H}_{18}$ ?

$$\begin{array}{r} \text{C } 8 \times 12.011 = 96.088 \\ \text{H } 18 \times 1.008 = 18.144 \\ \hline 114.232 \text{ amu} \end{array} \quad \begin{array}{r} 642 \text{ C}_8\text{H}_{18} \\ \hline 114.232 \text{ amu} \end{array} = 73,185$$

How many  $\text{H}_2\text{O}$  are produced if 642 atoms of  $\text{C}_8\text{H}_{18}$  are used?

$$\begin{array}{r} 642 \text{ C}_8\text{H}_{18} \\ \hline 2 \text{ C}_8\text{H}_{18} \end{array} \quad \begin{array}{r} 18 \text{ H}_2\text{O} \\ \hline 2 \text{ C}_8\text{H}_{18} \end{array} = 5,778$$

What is the mass of  $\text{H}_2\text{O}$  produced?

$$\begin{array}{r} 5780 \text{ H}_2\text{O} \\ \hline 1 \text{ H}_2\text{O} \end{array} \quad \begin{array}{r} 18 \text{ amu} \\ \hline 1 \text{ H}_2\text{O} \end{array} = 104040$$

$$\begin{array}{l} \text{H } 2 \times 1 = 2 \\ \text{O } 1 \times 16 = 16 \\ \hline 18 \end{array}$$

How many  $\text{O}_2$  are consumed if 642 atoms of  $\text{C}_8\text{H}_{18}$  are used?

$$\begin{array}{r} 642 \text{ C}_8\text{H}_{18} \\ \hline 2 \text{ C}_8\text{H}_{18} \end{array} \quad \begin{array}{r} 25 \text{ O}_2 \\ \hline 2 \text{ C}_8\text{H}_{18} \end{array} = 8025 \text{ O}_2$$

