High School Science Virtual Learning
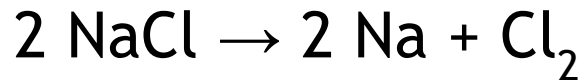
Chemistry
Gram to Gram Stoichiometry

April 16, 2020

High School Chemistry
Lesson: April 16, 2020

Objective/Learning Target:

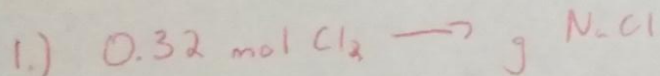Students will be able to convert between grams of the various substances in a chemical reaction.

Let's Get Started:
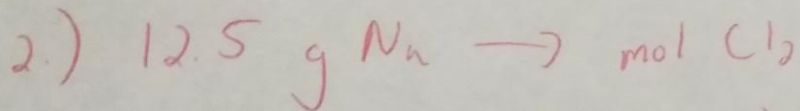## $2\ NaCl \rightarrow 2\ Na + Cl_2$

1. How many grams of sodium chloride are required to make 0.32 moles of chlorine?

2. If 12.5 g Na are produced from the reaction, how many moles of chlorine will be produced?

Let's Get Started: Answer Key

1.) 0.32 mol $Cl_2 \longrightarrow$ g $NaCl$

$$\dfrac{0.32 \text{ mol } Cl_2}{1} \left(\dfrac{2 \text{ mol } NaCl}{1 \text{ mol } Cl_2} \right) \left(\dfrac{58.443 g \; NaCl}{1 \text{ mol } NaCl} \right) = \boxed{37 g \; NaCl}$$

$$\begin{array}{r} 35.453 \text{ g/mol} \\ + \; 22.990 \text{ g/mol} \\ \hline 58.443 \text{ g/mol} \end{array}$$

2.) 12.5 g $Na \longrightarrow$ mol Cl_2

$$\dfrac{12.5 g \; Na}{1} \left(\dfrac{1 \text{ mol } Na}{22.990 g \; Na} \right) \left(\dfrac{1 \text{ mol } Cl_2}{2 \text{ mol } Na} \right) = \boxed{0.272 \text{ mol } Cl_2}$$

Lesson Activity:

Directions:

1. Watch this video, and answer these questions.
   a. What are the steps for converting grams to grams?
   b. What is used as the conversion factor for each?

Answers

    a.   g → mol → mol → g

    b.   g → mol (molar mass)
        mol → mol (mol ratio from coefficients)
        mol → g (molar mass)

Practice

Complete the following questions using the information you learned during the lesson activity.

Questions: $2\ Ga_2O_3 \rightarrow 4\ Ga + 3\ O_2$
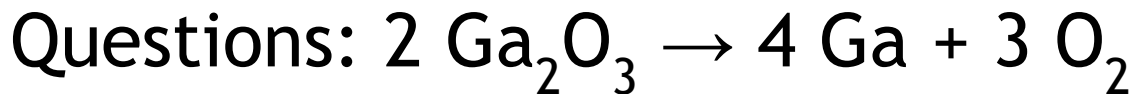
1. How many grams of oxygen can be produced from 15.2 grams of gallium oxide?
2. Gallium oxide decomposed to produce 0.12 grams of oxygen. What mass of gallium was produced?
3. If 2.437 grams of gallium formed, what was the mass of gallium oxide that reacted?

Once you have completed the practice questions check with the answer key.

1) $15.2 \text{ g } Ga_2O_3 \rightarrow \text{ g } O_2$

$$\frac{15.2 \text{ g } Ga_2O_3}{1} \left(\frac{1 \text{ mol } Ga_2O_3}{187.443 \text{ g } Ga_2O_3}\right) \left(\frac{3 \text{ mol } O_2}{2 \text{ mol } Ga_2O_3}\right) \left(\frac{31.998 \text{ g } O_2}{1 \text{ mol } O_2}\right) =$$

$$\boxed{= 3.89 \text{ mol g } O_2}$$

2.) $0.12 \text{ g } O_2 \rightarrow \text{ g } Ga$

$$\frac{0.12 \text{ g } O_2}{1} \left(\frac{1 \text{ mol } O_2}{31.998 \text{ g } O_2}\right) \left(\frac{4 \text{ mol } Ga}{3 \text{ mol } O_2}\right) \left(\frac{69.723 \text{ g } Ga}{1 \text{ mol } Ga}\right) = \boxed{0.35 \text{ g } Ga}$$

3.) $2.437 \text{ g } Ga \rightarrow Ga_2O_3$

$$\frac{2.437 \text{ g } Ga}{1} \left(\frac{1 \text{ mol } Ga}{69.723 \text{ g } Ga}\right) \left(\frac{2 \text{ mol } Ga_2O_3}{4 \text{ mol } Ga}\right) \left(\frac{187.443 \text{ g } Ga_2O_3}{1 \text{ mol } Ga_2O_3}\right) = 3.276 \text{ g } Ga_2O_3$$

Ga_2O_3
$Ga_2 = 139.446$
$O_3 = 47.997$
$187.443 \frac{g}{mol}$

O_2
$31.998 \frac{g}{mol}$

Ga
$69.723 \frac{g}{mol}$

More Practice:

Follow the links below to do more practice.
1. This website has worked out examples, and practice problems. Answers are given for odd numbers.
2. These practice problems have the answers on the second page.

Additional Practice:
Click on this link for additional practice.