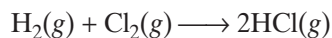


Consider the equation for the formation of hydrogen chloride from hydrogen and chlorine.



The equation indicates that 1 molecule of hydrogen reacts with 1 molecule of chlorine to produce 2 molecules of hydrogen chloride, giving the following molecular ratio of reactants and products.

1 molecule H_2 : 1 molecule Cl_2 : 2 molecules HCl

This ratio shows the smallest possible relative amounts of the reaction's reactants and products. To obtain larger relative amounts, we simply multiply each coefficient by the same number. Thus, 20 molecules of hydrogen would react with 20 molecules of chlorine to yield 40 molecules of hydrogen chloride. The reaction can also be considered in terms of amounts in moles: 1 mol of hydrogen molecules reacts with 1 mol of chlorine molecules to yield 2 mol of hydrogen chloride molecules.

2. *The relative masses of the reactants and products of a chemical reaction can be determined from the reaction's coefficients.* Recall from **Figure 4** in Chapter 7 that an amount of an element or compound in moles can be converted to a mass in grams by multiplying by the appropriate molar mass. We know that 1 mol of hydrogen reacts with 1 mol of chlorine to yield 2 mol of hydrogen chloride. The relative masses of the reactants and products are calculated as follows.

$$\cancel{1 \text{ mol H}_2} \times \frac{2.02 \text{ g H}_2}{\cancel{\text{mol H}_2}} = 2.02 \text{ g H}_2$$

$$\cancel{1 \text{ mol Cl}_2} \times \frac{70.90 \text{ g Cl}_2}{\cancel{\text{mol Cl}_2}} = 70.90 \text{ g Cl}_2$$

$$\cancel{2 \text{ mol HCl}} \times \frac{36.46 \text{ g HCl}}{\cancel{\text{mol HCl}}} = 72.92 \text{ g HCl}$$

The chemical equation shows that 2.02 g of hydrogen will react with 70.90 g of chlorine to yield 72.92 g of hydrogen chloride.

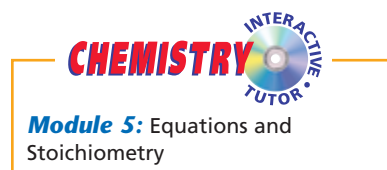


FIGURE 4 This representation of the reaction of hydrogen and chlorine to yield hydrogen chloride shows several ways to interpret the quantitative information of a chemical reaction.

