

## Mole Ratios

How can the coefficients in a chemical equation be interpreted?

### Why?

A balanced chemical equation can tell us the number of reactant and product particles (ions, atoms, molecules or formula units) that are necessary to conserve mass during a chemical reaction. Typically when we balance the chemical equation we think in terms of individual particles. However, in real life the reaction represented by an equation occurs an unimaginable number of times. Short of writing very large numbers ( $10^{23}$  or larger) in front of each chemical in the equation, how can we interpret chemical equations so that they more realistically represent what is happening in real life? In this activity you will explore the different ways a chemical reaction can be interpreted.

### Model 1 – A Chemical Reaction



1. Consider the reaction in Model 1.
  - a. What are the coefficients for each of the following substances in the reaction?



- b. Draw particle models below to illustrate the reaction in Model 1.



2. Consider each situation below as it relates to the reaction in Model 1.
  - a. Calculate the amount of reactants consumed and products made.
  - b. Record the ratio of  $\text{N}_2$  to  $\text{H}_2$  to  $\text{NH}_3$ . Reduce the ratio to the lowest whole numbers possible.

|                                                                                               | $\text{N}_2$<br>Consumed | $\text{H}_2$<br>Consumed | $\text{NH}_3$<br>Produced | Ratio $\text{N}_2:\text{H}_2:\text{NH}_3$<br>(reduced) |
|-----------------------------------------------------------------------------------------------|--------------------------|--------------------------|---------------------------|--------------------------------------------------------|
| For a single reaction, how many molecules of each substance would be consumed or produced?    | 1 molecule               | 3 molecules              | 2 molecules               | 1:3:2                                                  |
| If the reaction occurred one hundred times, how many molecules would be consumed or produced? | 100 molecules            | 300 molecules            | 200 molecules             | 1:3:2                                                  |
| If the reaction occurred 538 times, how many molecules would be consumed or produced?         | 538 molecules            | 1614 molecules           | 1076 molecules            | 1:3:2                                                  |

# Pogil Mole Ratios

**Guillaume Favre**

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the name Guillaume Favre.

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