

STOICHIOMETRY



Stoichiometry is the study of the **quantitative ratios** between the amounts of reactants and products. But the coefficients of a chemical reaction represent the number of molecules (atomic) and not the masses of molecules (macro). Therefore, we must have a conversion factor (this/that) to calculate the masses of the reactants and products.

Since matter is always conserved in chemical reactions (assumed), the amounts of reactants and products can be calculated by constructing a **mole ratio** to use as a **conversion factor**. **The mole ratio can be obtained from the coefficients of the balanced equation.**



The mole ratio for AgNO_3 and Cu would be $\frac{2 \text{ moles AgNO}_3}{1 \text{ mole Cu}}$

STEPS FOR CALCULATING MASSES IN REACTIONS

- Step 1:** Write a chemical equation for the reaction.
- Step 2:** Check all formulas and keep your hands off the subscripts once they're checked!!
- Step 3:** BALANCE the equation.
- Step 4:** Use the coefficients to determine the mole:mole ratio.
- Step 5:** Write all molar masses in parentheses **above** each formula (beware of diatomics!).
- Step 6:** Re-read the problem. Determine the **moles** of something!
- Step 7:** USE the mole:mole ratio to determine **moles** of everything!
- Step 8:** Re-read the problem and determine what you really need .

(Avogadro's number) (mole ratio) (molar mass)

REMEMBER: particles ↔ moles ↔ moles ↔ grams

EXERCISE: Iron reacts with oxygen to give iron (III) oxide. If an ordinary iron nail (assumed to be pure iron) has a mass of 1.05 g, how many grams of iron (III) oxide would it produce if the nail turned completely to rust? How many grams of oxygen are required for this reaction?

"Character is power." - Booker T. Washington