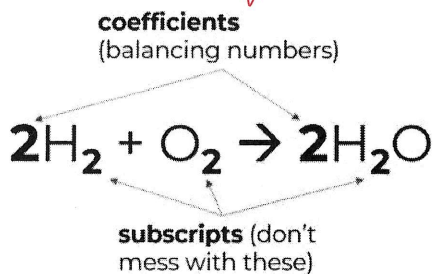


## Balancing Chemical Equations

- Chemical “recipes”: how much do you put in? how much do you expect to yield?
- **Conservation of mass:** no atoms are ever created or destroyed
- Balancing chemical formulas involves adding coefficients in front of elements and compounds until the total number of atoms of each element in the reactants equals the products.



**Reactants:** what goes into the reaction



**Products:** what comes out of the reaction

### Tips for Balancing

- **Goal:** the number of atoms of each element in the reactants equals the products. Guess and check until this happens!
- Remember your diatomic elements: H, I, Br, O, N, Cl, F.
- Balance atoms in compounds first. Save elements for last.
- If the same polyatomic ion appears in the reactants *and* products, you can often treat it as a group of atoms instead of splitting it up.
- At the end, reduce all coefficients to lowest whole-number terms.
- Note: Do not write a coefficient if there is only “1” of that element or compound.

### Trick for Combustion Reactions (e.g. #10-12)

1. Balance every atom except oxygen.	$\text{C}_6\text{H}_{14} + \text{O}_2 \rightarrow \underline{6} \text{CO}_2 + \underline{7} \text{H}_2\text{O}$
2. Find out how many oxygen atoms you need the <u>  </u> O <sub>2</sub> to contribute. Divide that number by 2. This is your <i>temporary</i> coefficient for O <sub>2</sub> .	$\text{C}_6\text{H}_{14} + \frac{19}{2} \text{O}_2 \rightarrow \underline{6} \text{CO}_2 + \underline{7} \text{H}_2\text{O}$
3. You are not allowed to have fractional coefficients in your final answer. Multiply all the coefficients by 2.	$\underline{2} \text{C}_6\text{H}_{14} + \underline{19} \text{O}_2 \rightarrow \underline{12} \text{CO}_2 + \underline{14} \text{H}_2\text{O}$

### Practice

- N<sub>2</sub> + 3 H<sub>2</sub> → 2 NH<sub>3</sub>
- 2 NaCl +    F<sub>2</sub> → 2 NaF +    Cl<sub>2</sub>
- 4 P + 5 O<sub>2</sub> → 2 P<sub>2</sub>O<sub>5</sub>
- 2 Ag<sub>2</sub>O → 4 Ag +    O<sub>2</sub>
- 2 NaBr +    CaF<sub>2</sub> → 2 NaF +    CaBr<sub>2</sub>
- FeCl<sub>3</sub> + 3 NaOH →    Fe(OH)<sub>3</sub> + 3 NaCl
- H<sub>2</sub>SO<sub>4</sub> + 2 NaNO<sub>2</sub> → 2 HNO<sub>2</sub> +    Na<sub>2</sub>SO<sub>4</sub>
- 6 CO<sub>2</sub> + 6 H<sub>2</sub>O →    C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> + 6 O<sub>2</sub>
- 2 HCl +    CaCO<sub>3</sub> →    CaCl<sub>2</sub> +    H<sub>2</sub>O +    CO<sub>2</sub>
- C<sub>3</sub>H<sub>8</sub> + 5 O<sub>2</sub> → 3 CO<sub>2</sub> + 4 H<sub>2</sub>O
- 2 C<sub>6</sub>H<sub>14</sub> + 19 O<sub>2</sub> → 12 CO<sub>2</sub> + 14 H<sub>2</sub>O
- 2 C<sub>8</sub>H<sub>18</sub> + 25 O<sub>2</sub> → 16 CO<sub>2</sub> + 18 H<sub>2</sub>O