

GENERAL CHEMISTRY

STANDARD 8.2

DEFINITIONS

- **Law of Conservation of Mass:** Matter cannot be created nor destroyed in a chemical reaction
- **Skeleton Equation:** Chemical equations that are not balanced and, therefore, do not satisfy the Law of Conservation of Mass
- **Stoichiometric Coefficient:** Numbers that are added to the front of molecules to represent multiple molecules needed to complete the chemical reaction that are added to balance a chemical equation
 - If no stoichiometric coefficient is needed for a certain chemical, no coefficient should be placed in front of the chemical (do not use a one)

EXAMPLES

- Balance the following chemical equation:
 - $\text{Fe (s)} + \text{H}_2\text{SO}_4 \text{ (aq)} \rightarrow \text{Fe}_2(\text{SO}_4)_3 \text{ (aq)} + \text{H}_2 \text{ (g)}$
 - First, count the number of each type of atom on each side of the equation:
 - Fe: 1 on left 2 on right
 - H: 2 on left 2 on right
 - S: 1 on left 3 on right
 - O: 4 on left 12 on right
 - HINT: Leave the individual elements until the end
 - Need 3 more sulfur and 8 more oxygen, multiply H_2SO_4 by 3:
 - $\text{Fe (s)} + 3 \text{H}_2\text{SO}_4 \text{ (aq)} \rightarrow \text{Fe}_2(\text{SO}_4)_3 \text{ (aq)} + \text{H}_2 \text{ (g)}$
 - Now, count the atoms again:
 - Fe: 1 on left 2 on right
 - H: 6 on left 2 on right
 - S: 3 on left 3 on right
 - O: 4 on left 12 on right

EXAMPLES

- Now balance the individual elements to balance the entire equation:
 - $2 \text{Fe (s)} + 3 \text{H}_2\text{SO}_4 \text{ (aq)} \rightarrow \text{Fe}_2(\text{SO}_4)_3 \text{ (aq)} + 3 \text{H}_2 \text{ (g)}$
 - Finally, count the number of each type of atom on each side of the equation:
 - Fe: 2 on left 2 on right
 - H: 6 on left 6 on right
 - S: 3 on left 3 on right
 - O: 12 on left 12 on right

EXAMPLES

- Balance the following chemical equation:
 - $\text{CH}_4 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{g})$
 - First, count the number of each type of atom on each side of the equation:
 - C: 1 on left 1 on right
 - H: 4 on left 2 on right
 - O: 2 on left 3 on right
 - Need 2 more hydrogen on right and one more oxygen on left:
 - $\text{CH}_4 (\text{g}) + 2 \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + 2 \text{H}_2\text{O} (\text{g})$
 - Now, count the atoms again:
 - C: 1 on left 1 on right
 - H: 4 on left 4 on right
 - O: 4 on left 4 on right

EXAMPLES

- Balance the following chemical equations:
 - $\text{SiO}_2 (\text{s}) + \text{HF} (\text{aq}) \rightarrow \text{SiF}_4 (\text{s}) + \text{H}_2\text{O} (\text{l})$
 - $\text{NH}_3 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow \text{NO} (\text{g}) + \text{H}_2\text{O} (\text{g})$
 - $\text{NaBr} (\text{aq}) + \text{Cl}_2 (\text{g}) \rightarrow \text{NaCl} (\text{aq}) + \text{Br}_2 (\text{l})$
 - $\text{Mg}(\text{OH})_2 (\text{aq}) + \text{HCl} (\text{aq}) \rightarrow \text{MgCl}_2 (\text{aq}) + \text{H}_2\text{O} (\text{l})$

EXAMPLES SOLUTIONS

- Balance the following chemical equations:

