

## Activity 5: Balancing Chemical Equations

### Learning Objectives

*Balance a simple chemical equation*

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**Completion Time** 45 Minutes

### Instructor Information

This is a first exposure to chemical equations and balancing.

### ANSWERS TO QUESTIONS

1. a.

| Element | Number in Reactants | Number in Product |
|---------|---------------------|-------------------|
| Carbon  | 1                   | 1                 |
| Oxygen  | 2                   | 2                 |

b. They are the same.

2. a. No, the equation is not balanced as written.

| Element  | Number in Reactants | Number in Product |
|----------|---------------------|-------------------|
| Hydrogen | 4                   | 2                 |
| Carbon   | 1                   | 1                 |
| Oxygen   | 2                   | 3                 |

b.  $\text{CH}_4(g) + 2\text{O}_2(g) \rightarrow \text{CO}_2(g) + 2\text{H}_2\text{O}(g)$

c.

| Element  | Number in Reactants | Number in Product |
|----------|---------------------|-------------------|
| Hydrogen | 4                   | 4                 |
| Carbon   | 1                   | 1                 |
| Oxygen   | 4                   | 4                 |

3. a.  $2\text{Fe}(s) + 3\text{Cl}_2(g) \rightarrow 2\text{FeCl}_3(s)$   
b.  $\text{NaOH}(s) + \text{CO}_2(g) \rightarrow \text{NaHCO}_3(s)$  balanced as given.  
c.  $\text{CaCN}_2(s) + 3\text{H}_2\text{O}(l) \rightarrow \text{CaCO}_3(s) + 2\text{NH}_3(g)$   
d.  $\text{CO}(g) + 2\text{H}_2(g) \rightarrow \text{CH}_3\text{OH}(g)$   
e.  $2\text{SO}_2(g) + \text{O}_2(g) \rightarrow 2\text{SO}_3(g)$   
f.  $\text{C}_{12}\text{H}_{22}\text{O}_{11}(s) \rightarrow 12\text{C}(s) + 11\text{H}_2\text{O}(g)$

### Activity 5: Skill Development

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Balance the following chemical equations

- a.  $2\text{NaBr}(s) + \text{CaF}_2(s) \rightarrow 2\text{NaF}(s) + \text{CaBr}_2(s)$   
b.  $3\text{Ca}(s) + 2\text{ScF}_3(s) \rightarrow 2\text{Sc}(s) + 3\text{CaF}_2(s)$   
c.  $2\text{C}_6\text{H}_5\text{COOH}(l) + 17\text{O}_2(g) \rightarrow 14\text{CO}_2(g) + 6\text{H}_2\text{O}(l)$   
d.  $2\text{KMnO}_4(s) + 16\text{HCl}(aq) \rightarrow 2\text{KCl}(aq) + 2\text{MnCl}_2(aq) + 8\text{H}_2\text{O}(l) + 5\text{Cl}_2(g)$   
e.  $2\text{C}_6\text{H}_6\text{S}_2(l) + 15\text{O}_2(g) \rightarrow 12\text{CO}(g) + 6\text{H}_2\text{O}(g) + 4\text{SO}_3(g)$   
f.  $4\text{KO}_2(s) + 2\text{CO}_2(g) \rightarrow 2\text{K}_2\text{CO}_3(s) + 3\text{O}_2(g)$