Balancing Act

Atoms are not _________ or _________ during a chemical reaction. Scientists know that there must be the _________ number of atoms on each _________ of the _________. To balance the chemical equation, you must add _________ in front of the chemical formulas in the equation. You cannot _________ or _________ subscripts!

1) Determine number of atoms for each element. on each side of the equation.

\[ \text{Mg} + \text{O}_2 \rightarrow \text{MgO} \]

\[ \text{Mg} = \quad \text{Mg} = \]

2) Pick an element that is not equal on both sides of the equation.

\[ O = \quad O = \]

3) Add a coefficient in front of the formula with that element and adjust your counts.

4) Continue adding coefficients to get the same number of atoms of each element on each side.

Try these:

\[ \text{Ca} + \text{O}_2 \rightarrow \text{CaO} \]

\[ \text{Ca} = \quad \text{Ca} = \]

\[ \text{O} = \quad \text{O} = \]

\[ \text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3 \]

\[ \text{N} = \quad \text{N} = \]

\[ \text{H} = \quad \text{H} = \]

\[ \text{Cu}_2\text{O} + \text{C} \rightarrow \text{Cu} + \text{CO}_2 \]

\[ \text{Cu} = \quad \text{Cu} = \]

\[ \text{O} = \quad \text{O} = \]

\[ \text{C} = \quad \text{C} = \]

\[ \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2 \]

\[ \text{H} = \quad \text{H} = \]

\[ \text{O} = \quad \text{O} = \]

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Balancing Act Practice

Balance each equation. Be sure to show your lists! Remember you cannot add subscripts or place coefficients in the middle of a chemical formula.

1. \( \text{Na} + \text{MgF}_2 \rightarrow \text{NaF} + \text{Mg} \)

2. \( \text{Mg} + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2 \)

3. \( \text{Cl}_2 + \text{KI} \rightarrow \text{KCl} + \text{I}_2 \)

4. \( \text{NaCl} \rightarrow \text{Na} + \text{Cl}_2 \)

5. \( \text{Na} + \text{O}_2 \rightarrow \text{Na}_2\text{O} \)

6. \( \text{Na} + \text{HCl} \rightarrow \text{H}_2 + \text{NaCl} \)

7. \( \text{K} + \text{Cl}_2 \rightarrow \text{KCl} \)

Challenge: This one is tough!

\( \text{C}_2\text{H}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} \)
Atoms are not **CREATED** or **DESTROYED** during a chemical reaction. Scientists know that there must be the **SAME** number of atoms on each **SIDE** of the **EQUATION**. To balance the chemical equation, you must add **COEFFICIENTS** in front of the chemical formulas in the equation. You cannot **ADD** or **CHANGE** subscripts!

Step 1: Determine number of atoms for each element.

\[\Box\text{Mg} + \Box\text{O}_2 \Rightarrow \Box\text{MgO}\]

\[\text{Mg} = \text{Mg} = \]

\[\text{O} = \text{O} = \]

Step 2: Pick an element that is not equal on both sides of the equation.

Step 3: Add a coefficient in front of the formula with that element and adjust your counts.

Step 4: Continue adding coefficients to get the same number of atoms of each element on each side.

**Try these:**

\[\Box\text{Ca} + \Box\text{O}_2 \Rightarrow \Box\text{CaO}\]

\[\text{Ca} = \text{Ca} = \]

\[\text{O} = \text{O} = \]

\[\Box\text{N}_2 + \Box\text{H}_2 \Rightarrow \Box\text{NH}_3\]

\[\text{N} = \text{N} = \]

\[\text{H} = \text{H} = \]

\[\Box\text{Cu}_2\text{O} + \Box\text{C} \Rightarrow \Box\text{Cu} + \Box\text{CO}_2\]

\[\text{Cu} = \text{Cu} = \]

\[\text{O} = \text{O} = \]

\[\text{C} = \text{C} = \]

\[\Box\text{H}_2\text{O}_2 \Rightarrow \Box\text{H}_2\text{O} + \Box\text{O}_2\]

\[\text{H} = \text{H} = \]

\[\text{O} = \text{O} = \]

Step-by-Step Example Problem:

Step 1: Determine number of atoms for each element.

\[ \text{Mg} + \text{O}_2 \rightarrow \text{MgO} \]

- Mg = 1
- O = 2

Step 2: Pick an element that is not equal on both sides of the equation.

\[ \text{Mg} + \text{O}_2 \rightarrow \text{MgO} \]

- Mg = 1
- O = 2

Since the O atoms are not equal, we’ll target those first!

Step 3: Add a coefficient in front of the formula with that element and adjust your counts.

\[ 2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO} \]

- Mg = 2
- O = 2

Adding a 2 in front of MgO will change the number of atoms on the product side of the equation.

Step 4: Continue adding coefficients to get the same number of atoms of each element on each side.

\[ 2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO} \]

- Mg = 2
- O = 2

Now we need to increase the number of Mg atoms we have on the reactant side. Adding a 2 in front of Mg will give us 2 atoms of Mg and balance the equation.
Balancing Act Answer Key:

Page 1 Problems

2 Ca + O₂ → 2 CaO
N₂ + 3 H₂ → 2 NH₃
2 Cu₂O + C → 4 Cu + CO₂
2 H₂O₂ → 2 H₂O + O₂  Hint: Add the O atoms on the product side together when doing the counts.

Page 2 Practice Problems

1. 2 Na + MgF₂ → 2 NaF + Mg
2. Mg + 2 HCl → MgCl₂ + H₂
3. Cl₂ + 2 KI → 2 KCl + I₂
4. 2 NaCl → 2 Na + Cl₂
5. 4 Na + O₂ → 2 Na₂O
6. 2 Na + 2 HCl → H₂ + 2 NaCl
7. 2 K + Cl₂ → 2 KCl

Challenge: This one is tough!

2 C₂H₆ + 7 O₂ → 4 CO₂ + 6 H₂O