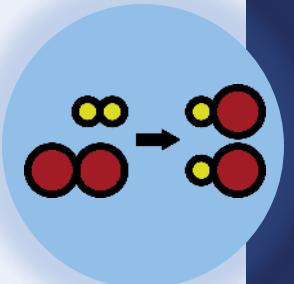


## Balancing Equations

Answer the questions below.

1. On which side of a chemical equation are reactants found?  
**The left hand side (before the arrow).**
2. What does a subscript represent in a chemical formula?  
**The number of that type of atom present in the formula.**
3. Why is mass conserved in chemical reactions?  
**Atoms are not created or destroyed, only rearranged.**
4. How many of each atom are present in  $2\text{Fe}_2\text{O}_3$ ?  
**4 iron atoms, 6 oxygen atoms.**
5. Is the following equation balanced? Explain your answer.  
 $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$

**No as there are more N atoms on the reactant side and more Hydrogen atoms on the product side. They should be equal.**



# Balancing Equations

C3.2.5

Science  
**Mastery**

C3.2.1 Prior Knowledge Review

C3.2.2 Relative Formula Mass

C3.2.3 Percentage by Mass

C3.2.4 Conservation of Mass

➤ **C3.2.5 Balancing Equations**

C3.2.6 Uncertainty

C3.2.7 Introducing Concentration

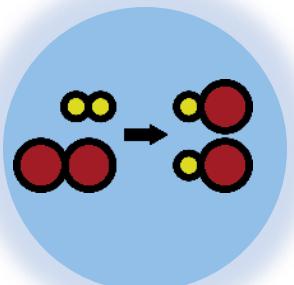


C3.2.8 Concentration Calculations

C3.2.9 Soluble Salts

C3.2.10 Making Soluble Salts

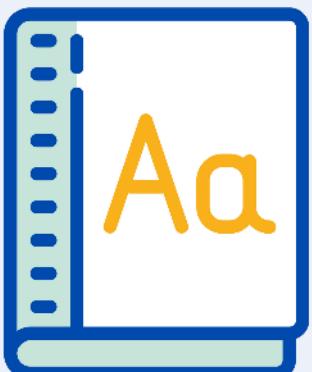
C3.2.11 Making Soluble Salts 2



## Following this lesson, students will be able to:

- Identify the number of atoms of each element in a chemical formula
- Describe the significance of placing a coefficient in front of a chemical formula in an equation
- Balance chemical equations

### Key Words:



reactant

atom

subscript

product

coefficient

element

# This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach, explanation, demonstration or modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.

**Answer the questions below.**

1. If 3 g of copper oxide and 2 g of carbon dioxide were produced, how many grams of copper carbonate was broken down?



- A. 1 g
- B. 6 g
- C. 5 g

2. When copper carbonate is heated, the mass recorded on a balance decreases. Which of the following is **false**?

- A. The loss in mass is due to a change in state.
- B. The loss in mass is due to a formation of gas.
- C. The mass of products equals the mass of reactants.

3. Which of the following is **correctly balanced**?

- A.  $2\text{P} + 5\text{O}_2 \rightarrow 2\text{P}_2\text{O}_5$
- B.  $2\text{P} + 5\text{O}_2 \rightarrow \text{P}_2\text{O}_5$
- C.  $4\text{P} + 5\text{O}_2 \rightarrow 2\text{P}_2\text{O}_5$

We can follow these steps to balance any chemical equation.

**Step 1:** Write out the equation neatly and divide it into two parts, reactants and products.

**Step 2:** List the elements on each side and check they are the same.

**Step 3:** Count the number of atoms of each element shown.

**Step 4:** Add coefficients to the equation to change the number of atoms to make them equal on both sides.



Hydrogen

~~2 atoms~~

4 atoms

Oxygen

2 atoms

Hydrogen

~~2 atoms~~

4 atoms

Oxygen

~~1 atom~~

2 atoms

**Rule: You can only add coefficients. You can't add subscripts or element symbols.**

## Drill

1. What is a coefficient?
2. Coefficients must never be...
3. What must you ensure when balancing an equation?
4. What is the first step in balancing chemical equations?
5. What is the second step in balancing chemical equations?
6. What is the third step in balancing chemical equations?
7. What is the 4th step in balancing chemical equations?
8. What must you never do when balancing equations?
9. In the equation below, how many H are present on each side?
10. In the equation below why can't I use  $\text{H}_2\text{O}_2$  instead of  $2\text{H}_2\text{O}$ ?



## Drill answers

1. The number in front of a chemical formula
2. Subscripted
3. The number of atoms of each element are the same before and after the reaction
4. Write the equation neatly, divide it into two parts
5. List the elements on each side and check they are the same
6. Count the number of atoms of each element
7. Add coefficients to the equation to change the number of atoms to make them equal on both sides
8. Can't add subscripts or extra symbols
9. 4
10.  $\text{H}_2\text{O}_2$  is hydrogen peroxide, only  $\text{H}_2\text{O}$  is produced in the reaction

I: We can follow these steps to balance any chemical equation.

**Step 1:** Write out the equation neatly and divide it into two parts, reactants and products.

**Step 2:** List the elements on each side and check they are the same.

**Step 3:** Count the number of atoms of each element shown.

**Step 4:** Add coefficients to the equation to change the number of atoms to make them equal on both sides.



Potassium

~~1 atom~~

4 atoms

Oxygen

2 atoms

Potassium

~~2 atoms~~

4 atoms

Oxygen

~~1 atom~~

2 atoms

**Rule: You can only add coefficients. You can't add subscripts or element symbols.**

We: We can follow these steps to balance any chemical equation.

**Step 1:** Write out the equation neatly and divide it into two parts, reactants and products.

**Step 2:** List the elements on each side and check they are the same.

**Step 3:** Count the number of atoms of each element shown.

**Step 4:** Add coefficients to the equation to change the number of atoms to make them equal on both sides.



Sodium

~~1 atom~~

2 atoms

Chlorine

2 atoms

Sodium

~~1 atom~~

2 atoms

Chlorine

~~1 atom~~

2 atoms

Rule: You can only add coefficients. You can't add subscripts or element symbols.

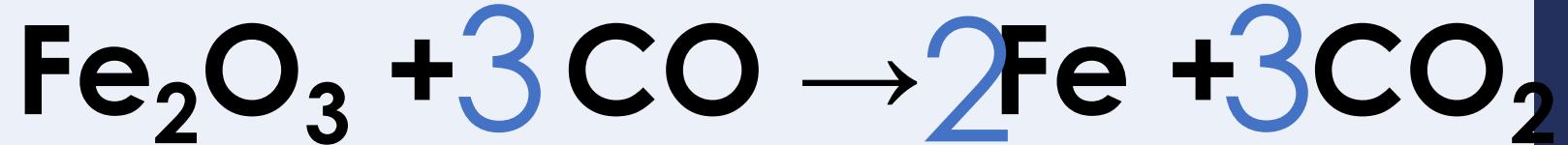
You: We can follow these steps to balance any chemical equation.

**Step 1:** Write out the equation neatly and divide it into two parts, reactants and products.

**Step 2:** List the elements on each side and check they are the same.

**Step 3:** Count the number of atoms of each element shown.

**Step 4:** Add coefficients to the equation to change the number of atoms to make them equal on both sides.



Iron	2 atoms	Iron	1 atom
Oxygen	<del>4 atoms</del>	Oxygen	<del>2 atoms</del>
	6 atoms		6 atoms
Carbon	<del>1 atom</del>	Carbon	<del>1 atom</del>
	3 atoms		3 atoms

**Rule:** You can only add coefficients. You can't add subscripts or element symbols.

Balance this chemical equation.



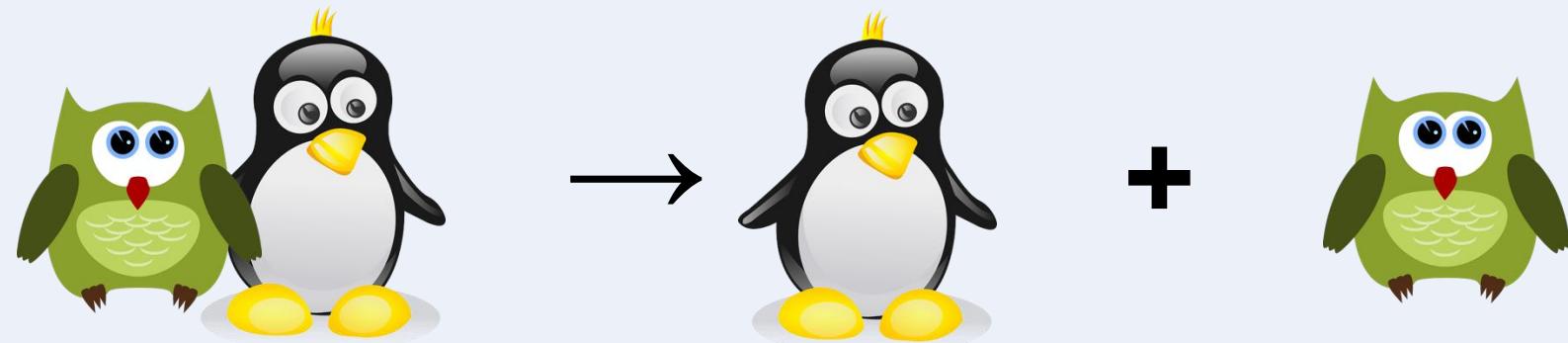
Check for understanding

Which of the following do you think best represents a chemical reaction?

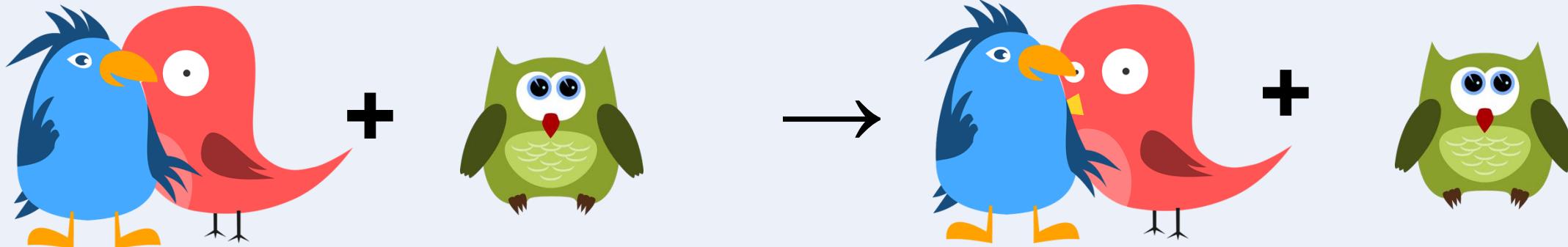
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2



3



Talk Task

## **Answer the questions below.**

1. Predict the products of the following equation:



- A.  $\text{ZnCl}_2 + \text{H}_2$
- B.  $\text{ZnCl} + \text{H}_2$
- C.  $\text{ZnCl} + \text{H}$

2. How many hydrogen atoms make up the products of this reaction?



- A. 28
- B. 16
- C. 34

3. Which equation demonstrates the law of conservation of mass?

- A.  $\text{CH}_4 + 2 \text{ O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- B.  $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{ H}_2\text{O}$
- C.  $\text{CH}_4 + 2 \text{ O}_2 \rightarrow \text{CO}_2 + 2 \text{ H}_2\text{O}$

## Lesson C3.2.5

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)  
or by emailing [sciencemastery@arkonline.org](mailto:sciencemastery@arkonline.org)  
Thank you!