

Decomposition reactions

Learning objectives

- 1 Identify decomposition reactions from a word equation or symbol equation.
- 2 Use the law of conservation of mass to balance simple decomposition reactions.

Introduction

Decomposition reactions are a key part of our everyday lives. The decomposition of hydrogen peroxide is responsible for bleaching hair, cleaning bathrooms and making paper white, while the decomposition of sodium hydrogen carbonate (baking soda) makes cakes rise and puts the bubbles in honeycomb.

Scientists are even looking to decomposition reactions to provide alternatives to fossil fuels, with the decomposition of water providing a cleaner source of energy for hydrogen-fuelled vehicles.

This worksheet will help you to discover what you know about these useful chemical reactions.

Questions

1. What is meant by a decomposition reaction? Use the following words to complete the sentences.

compound down elements two

A reaction where a _____ is broken _____ into _____
or more simpler compounds or _____.

2. Consider the following word equation for a thermal decomposition reaction:



(a) State if each substance is an element, compound or mixture. Circle the correct answer in the brackets.

- i. Lead carbonate is [an element / a compound / a mixture].
- ii. Lead oxide is [an element / a compound / a mixture].
- iii. Carbon dioxide is [an element / a compound / a mixture].

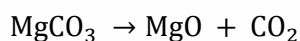
(b) Identify the reactants and products in the word equation above. Circle the correct answer in the brackets.

i. Lead carbonate is a [reactant / product].

ii. Lead oxide is a [reactant / product].

iii. Carbon dioxide is a [reactant / product].

3. Consider the following symbol equation for a thermal decomposition reaction:



(a) Draw a line to match the formula from the symbol equation to the name of each compound.

carbon dioxide

MgCO_3

magnesium carbonate

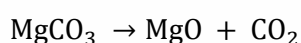
MgO

magnesium oxide

CO_2

(b) How do you know this is a thermal decomposition reaction?

(c) Is this equation balanced? How do you know?



To work this out, you must count the number of each element on both sides of the equation.

The table has been completed for you:

| Element | Number of each element | |
|-----------|------------------------|-----------------|
| | Left-hand side | Right-hand side |
| Magnesium | 1 | 1 |
| Carbon | 1 | 1 |
| Oxygen | 3 | 3 |

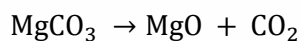
Complete the sentences using the words provided.

balanced **element** **equation** **same**

As there are the _____ number of atoms of each _____ on both sides of the _____, the equation is _____.

(d) If 18.5 grams of MgCO_3 were heated to a very high temperature and fully decomposed and 9.6 grams of MgO were left at the end of the reaction, how much CO_2 was produced?

i. Complete the calculation using the data above.



$$18.5\text{g} \rightarrow 9.6\text{g} + \text{CO}_2$$

$$\text{CO}_2 = \quad -$$

$$\text{CO}_2 = \quad \text{g}$$

ii. Complete the answer using the words provided.

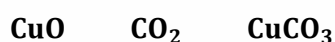
destroyed **mass** **products** **reactants**

The conservation of _____ states that atoms cannot be created or _____. Therefore, the mass of the _____ must be the same as the mass of the _____.

4. (a) State the word equation for the thermal decomposition of copper carbonate.

_____ \rightarrow _____ + _____

(b) Use the following formulas to create the symbol equation for the thermal decomposition of copper carbonate.



_____ \rightarrow _____ + _____

(c) Is your equation balanced? How do you know?

- i. Use the following table to count the number of each element on either side of the equation.

| Element | Number of each element | |
|---------|------------------------|-----------------|
| | Left-hand side | Right-hand side |
| Copper | | |
| Carbon | | |
| Oxygen | | |

- ii. Complete the sentences using the words provided.

balanced **element** **equation** **same**

This symbol equation is _____ as the number of atoms of each
_____ is the _____ on both sides of the _____.

Challenge

5. Mercury(II) oxide (HgO) decomposes if it is exposed to light or heated above 500°C .

(a) What are the names of the products formed?

_____ and _____

(b) Write a word equation for this decomposition.

Mercury(II) oxide \rightarrow _____ + _____

(c) What are the formulas of the products formed?

_____ and _____

(d) Write a balanced symbol equation for this reaction.

_____ HgO \rightarrow _____ + _____

(e) How do you know your equation is balanced?
