

Conservation Mass Relative Formula Mass

GCSE Chemistry · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Calculate the relative formula mass of calcium hydroxide, $\text{Ca}(\text{OH})_2$. ($\text{Ca} = 40$, $\text{O} = 16$, $\text{H} = 1$) (2 marks)

Step 1 · Count atoms

1 Ca, 2 O, 2 H (the 2 multiplies the bracket).

Step 2 · Multiply by A_r

$$40 + (2 \times 16) + (2 \times 1) = 40 + 32 + 2$$

Step 3 · Add

$$M_r = 74$$

Answer: 74

Check: M_r has no units.

2. Now try one with the steps

2.4 g of magnesium is burned in an open crucible and 4.0 g of magnesium oxide forms. Calculate the mass of oxygen that reacted and explain why the mass increased. (3 marks)

Step 1 · Conservation of mass

Step 2 · Calculate

Step 3 · Explain

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. State the law of conservation of mass. [1]

2. Calculate the relative formula mass of carbon dioxide, CO_2 . ($\text{C} = 12$, $\text{O} = 16$) [1]

3. Calculate the relative formula mass of sulfuric acid, H_2SO_4 . ($\text{H} = 1$, $\text{S} = 32$, $\text{O} = 16$) [1]

4. Calculate the relative formula mass of calcium hydroxide, $\text{Ca}(\text{OH})_2$. (Ca = 40, O = 16, H = 1) [2]
5. 2.4 g of magnesium burns to form 4.0 g of magnesium oxide. Calculate the mass of oxygen, in g, that reacted. [1]
6. Explain why the mass of the solid increases when magnesium is heated in an open crucible. [2]
7. 10.0 g of calcium carbonate is heated and 5.6 g of calcium oxide remains. Calculate the mass of carbon dioxide, in g, given off. [1]
8. Explain why the mass of a reaction flask decreases when marble chips react with acid in an open flask. [2]
9. Calculate the relative formula mass of magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$. (Mg = 24, N = 14, O = 16) [2]
10. Calculate the relative formula mass of ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$. (N = 14, H = 1, S = 32, O = 16) [2]
11. Calculate the percentage by mass of nitrogen in ammonium nitrate, NH_4NO_3 . (N = 14, H = 1, O = 16) [2]
12. Show that $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ is consistent with conservation of mass. (Mg = 24, O = 16) [2]
13. Three readings of a mass are 23.4 g, 23.8 g and 23.6 g. Calculate the mean, in g. [1]

14. For the readings in question 13, estimate the uncertainty in the mean, in g.

[1]

4. Before you hand it in

"Mass was lost, so conservation of mass doesn't apply."

Mass is always conserved; open systems can lose or gain gases.

Using atomic numbers instead of relative atomic masses

Use the larger number on the periodic table (A_r): carbon is 12, not 6.

Forgetting the bracket multiplier, e.g. $\text{Ca(OH)}_2 = 57$

$\text{Ca(OH)}_2 = 40 + 2 \times (16 + 1) = 74$.

Ignoring balancing numbers when checking conservation

Multiply each M_r by its balancing number before adding.