

# GCSE Chemistry

## Worksheet: Relative formula mass

|                       |                          |                              |                                   |
|-----------------------|--------------------------|------------------------------|-----------------------------------|
| TIME<br><b>35 min</b> | TOTAL<br><b>32 marks</b> | CALCULATOR<br><b>Allowed</b> | DIFFICULTY<br><b>Easy, Medium</b> |
|-----------------------|--------------------------|------------------------------|-----------------------------------|

**Topics:** Relative formula mass

**NAME** \_\_\_\_\_

**CLASS** \_\_\_\_\_

**DATE** \_\_\_\_\_

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Relative atomic masses ( $A_r$ ): O = 16, Cu = 63.5

0 1 . 1

Calculate the relative formula mass ( $M_r$ ) of copper(II) oxide, CuO.

.....

.....

.....

.....

$M_r$  = .....

**[2 marks]**

0 1 . 2

How many atoms in total are shown in the formula CuO?

.....

.....

.....

Number of atoms = .....

**[1 mark]**

0 2

Relative atomic masses ( $A_r$ ): H = 1, C = 12, N = 14, O = 16, Na = 23, S = 32

0 2 . 1

Which compound has the greatest relative formula mass ( $M_r$ )?

Tick (✓) **one** box.

Sodium hydroxide, NaOH

☐

Sodium carbonate, Na<sub>2</sub>CO<sub>3</sub>

☐

Sodium sulfate, Na<sub>2</sub>SO<sub>4</sub>

☐

Sodium nitrate, NaNO<sub>3</sub>

☐

[1 mark]

0 2 . 2

Calculate the relative formula mass ( $M_r$ ) of urea, CO(NH<sub>2</sub>)<sub>2</sub>.

.....

.....

.....

.....

$M_r$  = .....

[2 marks]

0 2 . 3

State the units of relative formula mass.

.....

.....

[1 mark]

0 3

Relative atomic masses ( $A_r$ ): H = 1, C = 12, N = 14, O = 16, Na = 23, Cl = 35.5

0 3 . 1

What is the relative formula mass ( $M_r$ ) of water,  $H_2O$ ?

Tick (✓) **one** box.

17

☐

18

☐

19

☐

33

☐

[1 mark]

0 3 . 2

Calculate the relative formula mass ( $M_r$ ) of sodium chloride, NaCl.

.....

.....

.....

$M_r =$  .....

[1 mark]

0 3 . 3

Calculate the relative formula mass ( $M_r$ ) of ammonia,  $NH_3$ .

.....

.....

.....

$M_r =$  .....

[1 mark]

0 3 . 4

Calculate the relative formula mass ( $M_r$ ) of carbon dioxide,  $CO_2$ .

.....

.....

.....

$M_r =$  .....

[1 mark]

0 4

Relative atomic masses ( $A_r$ ): N = 14, O = 16, Na = 23

0 4 . 1

Calculate the percentage by mass of nitrogen in sodium nitrate,  $\text{NaNO}_3$ .  
Give your answer to 3 significant figures.

.....

.....

.....

.....

.....

Percentage of nitrogen = ..... %

**[3 marks]**

0 5

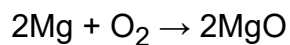
In a balanced equation, the sum of the relative formula masses of the reactants in the quantities shown equals the sum of the relative formula masses of the products in the quantities shown.

Table 1

| Substance        | Relative formula mass ( $M_r$ ) |
|------------------|---------------------------------|
| CuO              | 79.5                            |
| HCl              | 36.5                            |
| H <sub>2</sub> O | 18                              |

0 5 . 1

Magnesium burns in oxygen:



Relative atomic masses ( $A_r$ ): O = 16, Mg = 24

Show that the total relative formula mass of the reactants is equal to the total relative formula mass of the products.

.....

.....

.....

.....

[2 marks]

0 5 . 2

Copper(II) oxide reacts with hydrochloric acid:

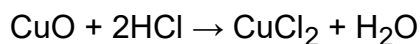


Table 1 shows the relative formula masses of three of the substances.

Use the equation and Table 1 to calculate the relative formula mass of copper(II) chloride,  $\text{CuCl}_2$ .

.....

.....

.....

.....

$M_r$  of  $\text{CuCl}_2$  = .....

[2 marks]

0 5 . 3

Explain why the total relative formula masses of the reactants and of the products are equal in a balanced equation.

.....

.....

[1 mark]

0 6

A company claims that its bath salts contain 'over 20% magnesium sulfate by mass'.

Magnesium sulfate has the formula  $\text{MgSO}_4$ .

Relative atomic masses ( $A_r$ ): O = 16, Mg = 24, S = 32

0 6 . 1

Calculate the relative formula mass ( $M_r$ ) of magnesium sulfate.

.....

.....

.....

$M_r$  = .....

[1 mark]

0 6 . 2

A 500 g tub of the bath salts contains 130 g of magnesium sulfate.  
Calculate the percentage by mass of magnesium sulfate in the bath salts.

.....

.....

.....

.....

Percentage of magnesium sulfate = ..... %

[2 marks]

0 6 . 3

Is the company’s claim correct? Give a reason for your answer.

.....

.....

[1 mark]

0 6 . 4

Calculate the percentage by mass of magnesium in magnesium sulfate.

.....

.....

.....

.....

Percentage of magnesium = ..... %

[2 marks]

0 6 . 5

Both of your percentages are percentages by mass. Explain why they are different.

.....

.....

[1 mark]

.....

0 7

Relative atomic masses ( $A_r$ ): H = 1, N = 14, Cl = 35.5

0 7 . 1

Calculate the percentage by mass of nitrogen in ammonium chloride,  $\text{NH}_4\text{Cl}$ .  
Give your answer to 3 significant figures.

.....

.....

.....

.....

.....

Percentage of nitrogen = ..... %

[3 marks]

0 8

Relative atomic masses ( $A_r$ ): N = 14, O = 16, Zn = 65

0 8 . 1

Calculate the relative formula mass ( $M_r$ ) of zinc nitrate,  $\text{Zn}(\text{NO}_3)_2$ .

.....

.....

.....

.....

$M_r$  = .....

[2 marks]

0 8 . 2

How many atoms in total are shown in the formula  $\text{Zn}(\text{NO}_3)_2$ ?

.....

.....

.....

Number of atoms = .....

[1 mark]

## **END OF QUESTIONS**

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

# Mark scheme

## GCSE Chemistry · Worksheet: Relative formula mass · 32 marks

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### Question 1 (3 marks)

01.1 [2 marks]

**Answer:** 79.5

- $63.5 + 16$  (1)
  - 79.5 (1)
- 

01.2 [1 mark]

**Answer:** 2

- 2 (1)
- 

### Question 2 (4 marks)

02.1 [1 mark]

**Correct:** Sodium sulfate,  $\text{Na}_2\text{SO}_4$

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02.2 [2 marks]

**Answer:** 60

- $12 + 16 + 2 \times (14 + 1 + 1)$  (1)
  - 60 (1)
- 

02.3 [1 mark]

- relative formula mass has no units (1)

**Notes:** Allow 'it is a ratio / relative quantity'.

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### Question 3 (4 marks)

03.1 [1 mark]

Correct: 18

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03.2 [1 mark]

Answer: 58.5

- 58.5 (1)
- 

03.3 [1 mark]

Answer: 17

- 17 (1)
- 

03.4 [1 mark]

Answer: 44

- 44 (1)
- 

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### Question 4 (3 marks)

04.1 [3 marks]

Answer: 16.5%

- $M_r$  of  $\text{NaNO}_3 = 85$  (1)
- $(14 \div 85) \times 100$  (1)
- 16.5 (%) (1)

**Notes:** An answer that is correct but not given to 3 significant figures scores one mark fewer.

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## Question 5 (5 marks)

### 05.1 [2 marks]

- reactants:  $(2 \times 24) + (2 \times 16) = 80$  (1)
  - products:  $2 \times (24 + 16) = 80$  (1)
- 

### 05.2 [2 marks]

**Answer:** 134.5

- $79.5 + (2 \times 36.5) = 152.5$  (1)
- $152.5 - 18 = 134.5$  (1)

**Notes:** Allow a correct answer calculated from relative atomic masses ( $63.5 + 2 \times 35.5$ ) for 2 marks.

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### 05.3 [1 mark]

- no atoms are lost or made / the same atoms are on both sides of the equation, just rearranged (1)
-

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## Question 6 (7 marks)

### 06.1 [1 mark]

**Answer:** 120

- 120 (1)

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### 06.2 [2 marks]

**Answer:** 26%

- $(130 \div 500) \times 100$  (1)
- 26 (%) (1)

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### 06.3 [1 mark]

- yes, because 26% is more than 20% (1)

**Notes:** Allow ECF from the percentage calculated above.

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### 06.4 [2 marks]

**Answer:** 20%

- $(24 \div 120) \times 100$  (1)
- 20 (%) (1)

**Notes:** Allow ECF from an incorrect  $M_r$ .

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### 06.5 [1 mark]

- one is the percentage of magnesium sulfate in the whole mixture (the bath salts); the other is the percentage of magnesium in the compound magnesium sulfate (1)

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## Question 7 (3 marks)

### 07.1 [3 marks]

**Answer:** 26.2%

- $M_r$  of  $\text{NH}_4\text{Cl} = 53.5$  (1)
- $(14 \div 53.5) \times 100$  (1)
- 26.2 (%) (1)

**Notes:** An answer that is correct but not given to 3 significant figures scores one mark fewer.

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### Question 8 (3 marks)

08.1 [2 marks]

**Answer:** 189

- $65 + (2 \times 14) + (6 \times 16)$  (1)
  - 189 (1)
- 

08.2 [1 mark]

**Answer:** 9

- 9 (1)
-