

Relative mass

These **Knowledge check worksheets** provide a series of questions to assess learners' knowledge and understanding of this topic at the end of a period of teaching or as revision. They are available at Foundation and Higher level and as fully editable versions so you can adapt them to suit learners' needs. Use for individual student work in class or at home. Find the full set of answers below.

Also available to assess this topic:

- **Review my learning worksheets:** available with three levels of scaffolded support to help build confidence in every learner. Use before, during or after teaching the relevant topic, to understand progress and identify misconceptions, rsc.li/44igB7V.
- **In context worksheets:** ask learners to apply their knowledge to interesting contexts from everyday life, helping them develop their skills and prepare for examination, including calculation questions to practise mathematical skills within a genuine chemical context, rsc.li/411kQnF.

Answers

Foundation

1.

- (a) **B** 0.1 nm [1 mark]
- (b) **D** 10 000 [1 mark]
- (c) An atom of ^{12}C contains six protons, six neutrons and six electrons. [1 mark]
The protons and neutrons are in the nucleus and the electrons orbit round the nucleus in shells. [1 mark]
- (d) The relative mass of protons and neutrons is one, while the relative mass of electrons is so small ($\frac{1}{1840}$) that their mass can be ignored. [1 mark]
The relative mass is due to the six protons and six neutrons only. [1 mark]

2.

(a) ^{12}C

[1 mark]

(b)

Element	Relative atomic mass (A_r)
Beryllium (Be)	63.5
Nitrogen (N)	127
Iron (Fe)	9
Copper (Cu)	56
Iodine (I)	14

[All correct – 3 marks, four or three correct – 2 marks, two correct – 1 mark]

(c) The relative atomic mass is an **average** (1) value that takes into account the abundance of isotopes of the element.Isotopes are **atoms** (1) of the same element with the same number of **protons** (1) but a different number of **neutrons** (1) in the nucleus.

[4 marks]

3.

(a)

- i. $63.5 + 16 = 79.5$ [1 mark]
- ii. $39 + 35.5 = 74.5$ [1 mark]
- iii. $24 + 32 = 56$ [1 mark]
- iv. $60 \times 12 = 720$ [1 mark]
- v. $24 + (2 \times 35.5) = 95$ [1 mark]
- vi. $16 + 1 = 17$ [1 mark]
- $40 + (2 \times 17) = 74$ [1 mark]
- vii. $14 + (3 \times 16) = 62$ [1 mark]
- $24 + (2 \times 62) = 148$ [1 mark]

(b) The relative atomic masses of oxygen and hydrogen are added together to give 17.

[1 mark]

The relative formula mass of the whole compound is 40.

$$40 - 17 = 23$$

So the relative atomic mass of X is 23.

[1 mark]

The element with a relative atomic mass of 23 is sodium (Na).

[1 mark]

4.

(a) $(6 \times 12) + (12 \times 1) + (6 \times 16)$ [1 mark]

Relative formula mass of glucose = 180 [1 mark]

(b) Multiply the relative atomic mass of carbon by 6 to give $6 \times 12 = 72$. [1 mark]

Substitute the values into the equation:

$$\text{Percentage of carbon in glucose (\%)} = \frac{72}{180} \times 100 = 40\% \quad [1 \text{ mark}]$$

[Total: 30 marks]**Higher**

1.

(a) **B** 0.1 nm [1 mark](b) **D** The radius of the whole atom is 10 000 times larger than the radius of the nucleus. [1 mark](c) An atom of ^{12}C contains six protons, six neutrons and six electrons. [1 mark]

The protons and neutrons are in the nucleus and the electrons orbit round the nucleus in shells. [1 mark]

(d) The relative mass of protons and neutrons is one, while the relative mass of electrons is so small that their mass can be ignored. [1 mark]

The relative mass is due to the six protons and six neutrons only. [1 mark]

2.

(a) ^{12}C [1 mark]

(b)

Element name	Chemical symbol	Relative atomic mass (A_r)
Beryllium	Be	9
Magnesium	Mg	24
Chlorine	Cl	35.5
Potassium	K	39
Iron	Fe	56
Copper	Cu	63.5
Sulfur	S	32
Iodine	I	127

[1 mark per correct column: 3 marks](b) The relative atomic mass is an **average** (1) value that takes into account the abundance of isotopes of the element.Isotopes are **atoms** (1) of the same element with the same number of **protons** (1) but a different number of **neutrons** (1) in the nucleus.**[4 marks]**

3.

(a)

i. $85 + 35.5 = 120.5$ [1 mark]

ii. $60 \times 12 = 720$ [1 mark]

iii. $40 + (2 \times 80) = 200$ [1 mark]

iv. $2 \times 27 = 54$ and $3 \times 16 = 48$ [1 mark]

$54 + 48 = 102$ [1 mark]

v. $14 + (3 \times 16) = 62$ [1 mark]

$40 + (2 \times 62) = 164$ [1 mark]

vi. $14 + (4 \times 1) = 18$ [1 mark]

$32 + (4 \times 16) = 96$ [1 mark]

$(18 \times 2) + 96 = 132$ [1 mark]

(b) The relative atomic masses of carbon and oxygen are added together:

$12 + (3 \times 16) = 60$ [1 mark]

The relative formula mass of the whole compound is 106, so to work out the atomic mass of *X*, we subtract 60 from 106:

$106 - 60 = 46$ [1 mark]

There are two atoms of *X* in the compound, so we need to divide 46 by two to give the relative atomic mass of *X*.Therefore, the relative atomic mass of *X* is 23 and the element with a relative atomic mass of 23 is sodium (Na). [1 mark]

4.

(a) $65 + (2 \times 35.5)$ [1 mark]

Relative formula mass of $\text{ZnCl}_2 = 136$ [1 mark]

Substitute the values into the equation:

Percentage of zinc in zinc chloride (%) = $\frac{65}{136} \times 100 = 47.8\%$ (to 3 sf) [1 mark]

(b) $(2 \times 12) + (4 \times 1)$ [1 mark]

Relative formula mass of $\text{C}_2\text{H}_4 = 28$ [1 mark]

Substitute the values into the equation:

Percentage of hydrogen in ethene (%) = $\frac{4 \times 1}{28} \times 100 = 14.3\%$ (to 3 sf) [1 mark]

(c) $(6 \times 12) + (12 \times 1) + (6 \times 16) = 72 + 12 + 96$ [1 mark]

Relative formula mass of $\text{C}_6\text{H}_{12}\text{O}_6 = 180$ [1 mark]

Substitute the values into the equation:

Percentage of carbon in glucose (%) = $\frac{(6 \times 12)}{180} \times 100 = 40\%$ (to 3 sf) [1 mark]

[Total: 36 marks]