

GCSE Combined Science: Trilogy

Worksheet: Relative atomic mass

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
-----------------------	--------------------------	------------------------------	-----------------------------------

Topics: Relative atomic 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

Antimony has two isotopes, antimony-121 and antimony-123.

Table 1 shows the percentage abundance of each isotope.

Table 1

Isotope	Percentage abundance (%)
antimony-121	57
antimony-123	43

0 1 . 1

Calculate the relative atomic mass (A_r) of antimony. Use the equation:

$$A_r = \frac{[(\text{mass number} \times \text{percentage abundance}) + (\text{mass number} \times \text{percentage abundance})]}{100}$$

Give your answer to 1 decimal place.

.....

.....

.....

.....

Relative atomic mass =

[2 marks]

0 1 . 2

Explain why the relative atomic mass of antimony is closer to 121 than to 123.

.....

.....

[1 mark]

0 2

Iridium has two isotopes, iridium-191 and iridium-193.
Table 2 shows the percentage abundance of each isotope.

Table 2

Isotope	Percentage abundance (%)
iridium-191	37
iridium-193	63

0 2 . 1

Calculate the relative atomic mass (A_r) of iridium. Use the equation:
 $A_r = [(mass\ number \times percentage\ abundance) + (mass\ number \times percentage\ abundance)] \div 100$
Give your answer to 1 decimal place.

.....

.....

.....

.....

Relative atomic mass =

[2 marks]

0 2 . 2

Explain why the relative atomic mass of iridium is closer to 193 than to 191.

.....

.....

[1 mark]

0 3

Relative atomic mass takes into account the different isotopes of an element.

0 3 . 1

What is the relative atomic mass of an element?

Tick (✓) **one** box.

The mass of the most common isotope only

☐

An average mass of the isotopes, taking into account their abundance

☐

The total mass of all the isotopes added together

☐

The mass of the heaviest isotope only

☐

[1 mark]

0 3 . 2

An element has two isotopes, with mass numbers 63 and 65. The two isotopes have equal abundances.

What is the relative atomic mass of the element?

Tick (✓) **one** box.

63

☐

64

☐

65

☐

128

☐

[1 mark]

0 4

Bromine has two isotopes, bromine-79 and bromine-81. The two isotopes have almost equal abundances.

The atomic number of bromine is 35.

0 4 . 1

Suggest the approximate relative atomic mass of bromine.

.....

.....

.....

[1 mark]

0 4 . 2

Give the number of neutrons in an atom of bromine-81.

.....

.....

.....

Number of neutrons =

[1 mark]

0 4 . 3

Complete the sentence.
Isotopes of the same element have the same number of but a different number of

.....

.....

.....

.....

[2 marks]

0 5

Gallium has two isotopes. Table 3 shows the percentage abundance of each isotope.

Table 3

Isotope	Mass number	Percentage abundance (%)
Gallium-69	69	60
Gallium-71	71	40

0 5 . 1

Complete the sentence.
Tick (✓) **one** box.
The relative atomic mass of an element is value that takes account of the abundance of the isotopes of the element.

an average

an exact

the largest

the smallest

☐

☐

☐

☐

[1 mark]

0 5 . 2

Calculate the relative atomic mass of gallium.

Use the equation:

relative atomic mass = [(mass number × abundance of isotope 1) + (mass number × abundance of isotope 2)] ÷ 100

.....

.....

.....

.....

Relative atomic mass =

[2 marks]

0 5 . 3

Explain why the relative atomic mass of gallium is closer to 69 than to 71.

.....

.....

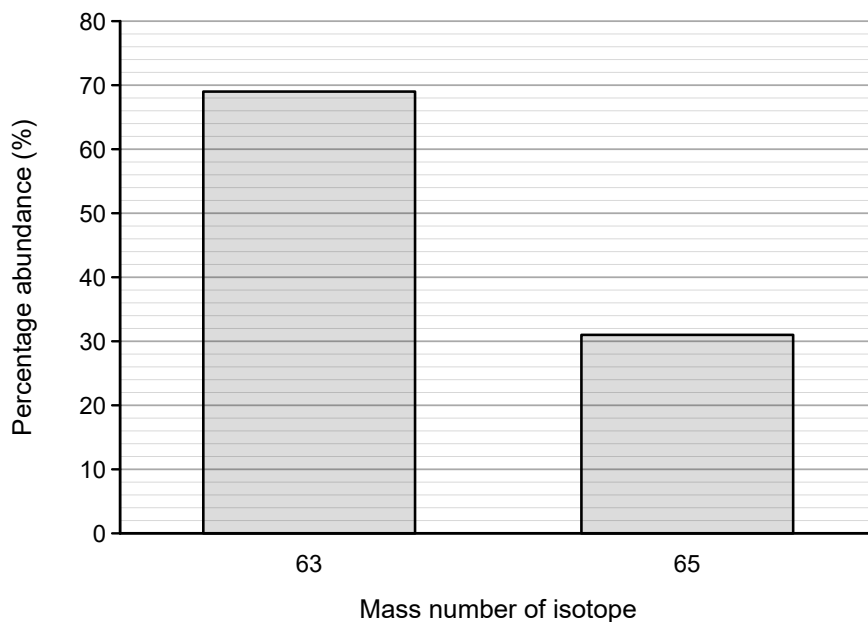
[1 mark]

.....

0 6

Copper has two isotopes. Figure 1 shows the percentage abundance of each isotope. The atomic number of copper is 29.

Figure 1



0 6 . 1

Use Figure 1 to calculate the relative atomic mass of copper. Give your answer to 1 decimal place.

.....

.....

.....

.....

Relative atomic mass =

[2 marks]

0 6 . 2

Give the number of neutrons in an atom of each isotope of copper.

.....

.....

.....

.....

[2 marks]

0 6 . 3

Explain why both isotopes of copper react in the same way with oxygen.

.....

.....

[1 mark]

0 7

Copper has two isotopes. 69% of copper atoms are copper-63 and 31% are copper-65.

A student calculated the relative atomic mass of copper like this:

$$(63 + 65) \div 2 = 64.0$$

0 7 . 1

Explain the mistake in the student's method.

.....

.....

[1 mark]

0 7 . 2

Calculate the correct relative atomic mass of copper. Give your answer to 1 decimal place.

.....

.....

.....

.....

Relative atomic mass =

[2 marks]

0 7 . 3

Explain why the correct value is closer to 63 than to 65.

.....

.....

[1 mark]

0 8

Table 4 shows information about the isotopes of neon.

Table 4

Isotope	Percentage abundance (%)
^{20}Ne	90.5
^{21}Ne	0.3
^{22}Ne	9.2

0 8 . 1

Calculate the relative atomic mass of neon.
Give your answer to 1 decimal place.

.....

.....

.....

.....

.....

Relative atomic mass =

[3 marks]

0 8 . 2

Explain why the relative atomic mass of neon is not a whole number.

.....

.....

[1 mark]

0 8 . 3

The atomic number of neon is 10.
How many neutrons are in an atom of ^{22}Ne ?

.....

.....

.....

.....

[1 mark]

0 9

Chlorine has two isotopes, chlorine-35 and chlorine-37. The relative atomic mass of chlorine is 35.5.

0 9 . 1

A student says:

‘Because chlorine has isotopes with mass numbers 35 and 37, its relative atomic mass must be exactly 36.’

Evaluate this claim.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

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

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Relative atomic mass · 32 marks

Question 1 (3 marks)

01.1 [2 marks]

Answer: 121.9

- $(121 \times 57) + (123 \times 43) (= 12\,186)$ (1)
- 121.9 (1)

Notes: An answer of 121.86 (not given to 1 decimal place) scores 1 mark.

01.2 [1 mark]

Answer: Antimony-121 has the higher percentage abundance.

- antimony-121 has the higher (percentage) abundance / there are more atoms of antimony-121 (1)
-

Question 2 (3 marks)

02.1 [2 marks]

Answer: 192.3

- $(191 \times 37) + (193 \times 63) (= 19\,226)$ (1)
- 192.3 (1)

Notes: An answer of 192.26 (not given to 1 decimal place) scores 1 mark.

02.2 [1 mark]

Answer: Iridium-193 has the higher percentage abundance.

- iridium-193 has the higher (percentage) abundance / there are more atoms of iridium-193 (1)
-

Question 3 (2 marks)

03.1 [1 mark]

Correct: An average mass of the isotopes, taking into account their abundance

03.2 [1 mark]

Correct: 64

Question 4 (4 marks)

04.1 [1 mark]

Answer: 80

- 80 (1)

Notes: Allow 79.9.

04.2 [1 mark]

Answer: 46

- 46 (1)
-

04.3 [2 marks]

Answer: protons; neutrons

- protons (1)
- neutrons (1)

Notes: Allow electrons for the first gap.

Question 5 (4 marks)

05.1 [1 mark]

Correct: an average

05.2 [2 marks]

Answer: 69.8

- $(69 \times 60) + (71 \times 40) (= 6980)$ (1)
- 69.8 (1)

Notes: An answer of 69.8 scores 2 marks.

05.3 [1 mark]

Answer: There is more gallium-69 than gallium-71 (it has a higher abundance).

- gallium-69 has a higher (percentage) abundance / there are more atoms of gallium-69 (1)
-

Question 6 (5 marks)

06.1 [2 marks]

Answer: 63.6

- $[(63 \times 69) + (65 \times 31)] \div 100$ (1)
- 63.6 (1)

Notes: An answer of 63.6 scores 2 marks. 63.62 (not to 1 decimal place) scores 1 mark. Allow readings of 68–70 for copper-63 with 32–30 for copper-65 (adding up to 100); these all give 63.6.

06.2 [2 marks]

Answer: copper-63: 34; copper-65: 36

- copper-63: 34 (1)
- copper-65: 36 (1)

06.3 [1 mark]

Answer: They have the same number of electrons / the same electronic structure.

- same number of electrons / same electronic structure (1)

Question 7 (4 marks)

07.1 [1 mark]

Answer: The student found a simple mean and ignored the different abundances of the isotopes.

- the student did not take the abundances into account / found a simple mean, but the isotopes are not equally abundant (1)

07.2 [2 marks]

Answer: 63.6

- $(63 \times 69) + (65 \times 31)$ (= 6362), $\div 100$ (1)
- 63.6 (1)

Notes: An answer of 63.62 (not 1 decimal place) scores 1 mark.

07.3 [1 mark]

Answer: Copper-63 is more abundant than copper-65.

- copper-63 has the higher (percentage) abundance (1)
-

Question 8 (5 marks)

08.1 [3 marks]

Answer: 20.2

- $(20 \times 90.5) + (21 \times 0.3) + (22 \times 9.2) (= 2018.7)$ (1)
- $\div 100 (= 20.187)$ (1)
- 20.2 (1)

Notes: An answer of 20.2 scores 3 marks. 20.187 or 20.19 scores 2 marks.

08.2 [1 mark]

Answer: It is a (weighted) average of the masses of the isotopes.

- it is an average / mean of the masses of the isotopes (taking account of their abundance) (1)
-

08.3 [1 mark]

Answer: 12

- 12 (1)
-

Question 9 (2 marks)

09.1 [2 marks]

Answer: The student is wrong: relative atomic mass is a weighted average that depends on the abundance of each isotope, not simply the midpoint; since the actual value (35.5) is closer to 35, chlorine-35 must be the more abundant isotope.

- relative atomic mass is a weighted average that depends on the (percentage) abundance of each isotope, not just the midpoint of the mass numbers (1)
 - the actual value (35.5) is closer to 35, so chlorine-35 must be more abundant than chlorine-37 (1)
-