

GCSE Combined Science: Trilogy

Worksheet: Mass number, atomic number and isotopes

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Mass number, atomic number and isotopes

NAME	CLASS	DATE
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- 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

An isotope of an element X is written in the form ${}^A_Z\text{X}$.

0 1 . 1

What does A represent?

Tick (✓) **one** box.

The mass number

☐

The atomic number

☐

The number of electrons

☐

The number of neutrons

☐

[1 mark]

0 1 . 2

What does Z represent?

Tick (✓) **one** box.

The mass number

☐

The atomic number

☐

The number of electrons

☐

The number of neutrons

☐

[1 mark]

0 2

Table 1 shows the mass number and atomic number of three isotopes.

Table 1

Isotope	Mass number	Atomic number	Number of neutrons
Carbon-12	12	6	
Carbon-14	14	6	
Oxygen-18	18	8	

0 2 . 1 Complete Table 1 to show the number of neutrons in each isotope.

.....
[3 marks]

0 3

An atom of argon can be represented as $^{36}_{18}\text{Ar}$.

0 3 . 1 Give the number of protons, the number of neutrons and the number of electrons in this atom.

.....
.....
.....
.....
.....
Protons, neutrons, electrons =

[3 marks]

0 4

An atom of potassium can be represented as $^{39}_{19}\text{K}$.

0 4 . 1

What is the atomic number of this atom?

.....

.....

.....

Atomic number =

[1 mark]

0 4 . 2

How many neutrons are in the nucleus of this atom?

.....

.....

.....

Number of neutrons =

[1 mark]

0 4 . 3

How many electrons does this atom have? Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 4 . 4

What name is given to the total number of protons and neutrons in an atom?

.....

.....

.....

.....

[1 mark]

0 5

Chlorine has two naturally occurring isotopes, $^{35}_{17}\text{Cl}$ and $^{37}_{17}\text{Cl}$.

0 5 . 1

What are isotopes?

.....

.....

.....

.....

[2 marks]

0 5 . 2

Table 2

Isotope	Number of protons	Number of neutrons	Number of electrons
chlorine-35			
chlorine-37			

Complete Table 2 for an atom of each isotope.

[3 marks]

0 5 . 3

Explain why the nuclei of the two isotopes have the same charge but different masses.

.....

.....

.....

.....

[2 marks]

0 6

A lithium atom can be represented as ${}^7_3\text{Li}$.

0 6 . 1

The lithium atom loses one electron.

Name the type of particle that is formed.

.....

.....

.....

.....
[1 mark]

0 6 . 2

Give the number of protons, the number of neutrons and the number of electrons in the particle formed.

.....

.....

.....

.....

.....

.....

[3 marks]

0 6 . 3

What is the overall charge of the particle formed? Explain your answer.

.....

.....

.....

.....

[2 marks]

0 6 . 4

Another atom of lithium has a mass number of 6.

Describe how the nucleus of this atom is different from the nucleus of ${}^7_3\text{Li}$.

.....

.....

[1 mark]

0 7

0 7 . 1

A student says:

‘Carbon-12 and carbon-14 must be different elements, because they have different masses.’

Evaluate this statement.

.....

.....

.....

.....

.....

.....

[3 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: Mass number, atomic number and isotopes · 30 marks

Question 1 (2 marks)

01.1 [1 mark]

Correct: The mass number

01.2 [1 mark]

Correct: The atomic number

Question 2 (3 marks)

02.1 [3 marks]

Answer: Carbon-12 = 6, Carbon-14 = 8, Oxygen-18 = 10

- Carbon-12: $12 - 6 = 6$ (1)
 - Carbon-14: $14 - 6 = 8$ (1)
 - Oxygen-18: $18 - 8 = 10$ (1)
-
-

Question 3 (3 marks)

03.1 [3 marks]

Answer: 18, 18, 18

- protons = 18 (1)
 - neutrons = $36 - 18 = 18$ (1)
 - electrons = 18 (equal to the number of protons in an atom) (1)
-

Question 4 (5 marks)

04.1 [1 mark]

Answer: 19

- 19 (1)

04.2 [1 mark]

Answer: 20

- 20 (1)

04.3 [2 marks]

Answer: 19, because an atom has equal numbers of protons and electrons.

- 19 (1)
- atoms have no overall charge, so the number of electrons equals the number of protons (1)

04.4 [1 mark]

Answer: Mass number

- mass number (1)

Question 5 (7 marks)

05.1 [2 marks]

Answer: Atoms of the same element (same number of protons) with different numbers of neutrons.

- atoms of the same element / with the same number of protons (1)
- with different numbers of neutrons (1)

05.2 [3 marks]

Answer: chlorine-35: 17 protons, 18 neutrons, 17 electrons; chlorine-37: 17 protons, 20 neutrons, 17 electrons

- 17 protons in both (1)
- 18 neutrons in chlorine-35 and 20 neutrons in chlorine-37 (1)
- 17 electrons in both (1)

05.3 [2 marks]

Answer: Both nuclei contain 17 protons, so they have the same charge; the numbers of neutrons, which have mass but no charge, are different.

- they have the same number of protons, so the same (positive) charge (1)
 - they have different numbers of neutrons, which have mass but no charge (1)
-

Question 6 (7 marks)

06.1 [1 mark]

Answer: A positive ion

- (positive) ion (1)

Notes: Do not accept 'negative ion'.

06.2 [3 marks]

Answer: 3 protons, 4 neutrons, 2 electrons

- 3 protons (1)
 - 4 neutrons (1)
 - 2 electrons (1)
-

06.3 [2 marks]

Answer: +1, because it has 3 protons but only 2 electrons.

- +1 / positive (1)
- it has one more proton than electrons / 3 positive charges but only 2 negative charges (1)

Notes: The explanation mark depends on the first mark.

06.4 [1 mark]

Answer: It has 3 neutrons instead of 4 (the same 3 protons).

- it has one fewer neutron (3 neutrons instead of 4) (1)
-

Question 7 (3 marks)

07.1 [3 marks]

Answer: Incorrect: both have 6 protons, so both are carbon. They are isotopes of the same element, differing only in neutron number.

- the statement is incorrect (1)
 - carbon-12 and carbon-14 have the same number of protons (atomic number 6), which is what determines the element (1)
 - they are isotopes of the same element (carbon); they differ only in the number of neutrons, which gives them different masses (mass numbers) (1)
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