

GCSE Combined Science: Trilogy

Worksheet: The structure of an atom

TIME 25 min	TOTAL 24 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: The structure of an atom

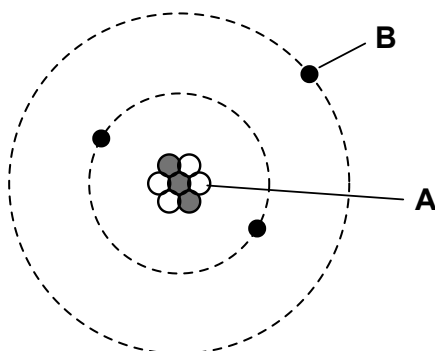
NAME _____ **CLASS** _____ **DATE** _____

- 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

Figure 1 shows a simple model of an atom.

Figure 1



0 1 . 1

Name the part of the atom labelled A.

.....

.....

.....

.....
[1 mark]

0 1 . 2

Which **two** types of particle are found in part A?

Tick (✓) **two** boxes.

Electrons

☐

Ions

☐

Neutrons

☐

Protons

☐

[2 marks]

0 1 . 3

What is the charge of the particle labelled B?

.....

.....

.....

[1 mark]

0 1 . 4

What is the approximate radius of an atom?

Tick (✓) **one** box.

1×10^{-15} m

☐

1×10^{-10} m

☐

1×10^{-5} m

☐

1×10^{-2} m

☐

[1 mark]

0 2

0 2 . 1

Which particle has a relative charge of 0 and a relative mass of approximately 1?

Tick (✓) **one** box.

Proton

☐

Neutron

☐

Electron

☐

[1 mark]

0 2 . 2

State the relative charge of a proton.

.....

.....

.....

[1 mark]

0 3

The radius of an atom is about 1×10^{-10} m. The radius of a nucleus is less than 1/10 000 of the radius of the atom.

0 3 . 1

Calculate the maximum radius of the nucleus of an atom of radius 1×10^{-10} m.

.....

.....

.....

.....

Maximum radius = m

[2 marks]

0 3 . 2

A teacher makes a scale model of an atom. A bead of radius 2.0 mm represents the nucleus.

Calculate the minimum radius of the atom in the model. Give your answer in metres.

.....

.....

.....

.....

Radius = m

[2 marks]

0 3 . 3

Most of the mass of an atom is concentrated in the nucleus.
Explain why an atom is described as mostly empty space.

.....

.....

.....

.....

[2 marks]

0 4

The diameter of a typical atom is about 2×10^{-10} m.

0 4 . 1

An atom has no overall electric charge.
Explain why, in terms of its protons and electrons.

.....

.....

.....

.....

[2 marks]

0 4 . 2

Estimate how many atoms, placed side by side in a straight line, would fit into a distance of 1 mm (1×10^{-3} m).

.....

.....

.....

.....

Number of atoms =

[2 marks]

0 5

0 5 . 1

Describe how electrons are arranged in an atom, and explain what happens to an electron's energy if it moves to a shell (energy level) further from the nucleus.

[3 marks]

0 6

The electrons in an atom are arranged at different distances from the nucleus. These are different energy levels.

0 6 . 1

An electron absorbs electromagnetic radiation.
Describe how the position of the electron can change.

[1 mark]

0 6 . 2

Later, the electron moves back to a lower energy level.
What does the atom emit when this happens?

[1 mark]

0 6 . 3

If an outer electron absorbs enough energy, it can leave the atom.
Name the particle that is left behind and give its charge.

.....

.....

.....

.....

[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: The structure of an atom · 24 marks

Question 1 (5 marks)

01.1 [1 mark]

Answer: Nucleus

- nucleus (1)
-

01.2 [2 marks]

Correct: Neutrons; Protons

01.3 [1 mark]

Answer: Negative

- negative (1)
-

01.4 [1 mark]

Correct: 1×10^{-10} m

Question 2 (2 marks)

02.1 [1 mark]

Correct: Neutron

02.2 [1 mark]

Answer: +1

- +1 (positive) (1)
-

Question 3 (6 marks)

03.1 [2 marks]

Answer: 1×10^{-14} m

- $1 \times 10^{-10} \div 10\,000$ (1)
- 1×10^{-14} (m) (1)

03.2 [2 marks]

Answer: 20 m

- $2.0\text{ mm} \times 10\,000 = 20\,000\text{ mm}$ (1)
- 20 (m) (1)

Notes: An answer of 20 000 (not converted to metres) scores 1 mark.

03.3 [2 marks]

Answer: The nucleus is at least 10 000 times smaller in radius than the atom and the electrons are far away from it, so almost all of the volume of the atom contains nothing.

- the nucleus is tiny compared with the atom / at least 10 000 times smaller in radius (1)
- the electrons are far from the nucleus, so most of the volume of the atom contains no particles (1)

Question 4 (4 marks)

04.1 [2 marks]

Answer: It has equal numbers of protons and electrons, so their positive and negative charges cancel out.

- the number of protons equals the number of electrons (1)
- the (positive) charge of the protons and the (negative) charge of the electrons cancel out (1)

04.2 [2 marks]

Answer: 5×10^6

- $n = 1 \times 10^{-3} \div 2 \times 10^{-10}$ (1)
- 5×10^6 (5 000 000) (1)

Question 5 (3 marks)

05.1 [3 marks]

Answer: Electrons orbit the nucleus in shells (energy levels) at particular distances; moving to a shell further out means moving to a higher energy level, so the electron must absorb electromagnetic radiation.

- electrons orbit the nucleus in shells (energy levels) at particular distances from the nucleus (1)
 - moving to a shell further from the nucleus means moving to a higher energy level — the electron's energy increases (1)
 - it must absorb (electromagnetic) radiation / energy to do this (1)
-

Question 6 (4 marks)

06.1 [1 mark]

Answer: It moves further from the nucleus, to a higher energy level.

- the electron moves further from the nucleus / to a higher energy level (1)
-

06.2 [1 mark]

Answer: Electromagnetic radiation

- electromagnetic radiation (e.g. light) (1)
-

06.3 [2 marks]

Answer: A positive ion

- an ion (1)
 - positive (+1) (1)
-