AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.1.1.3

The development of the model of the atom (common content with physics)

Past-paper questions

Tier	**Higher**
Question groups	**3**
Available paper years	**2020–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

5.1.1.3 The development of the model of the atom (common content with physics)

Question 01

November 2020 | 8464/C/1H | Original Q6

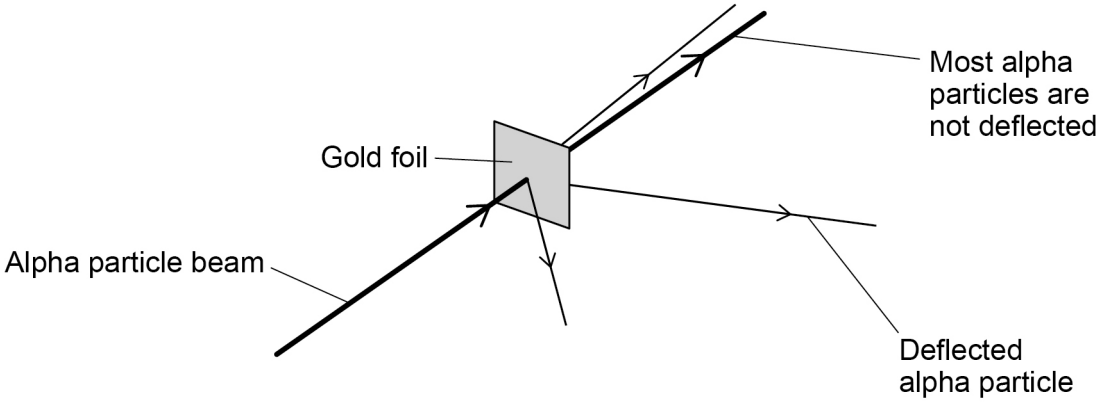
0 6 This question is about gold and compounds of gold.

0 6 . 1 In the alpha particle scattering experiment alpha particles are fired at gold foil.

Alpha particles are positively charged.

Figure 5 shows the results.

Figure 5



What **two** conclusions can be made from the results?

[2 marks]

Tick (✓) **two** boxes.

Atoms are balls of positive charge with embedded electrons. ☐

Atoms are tiny spheres that cannot be divided. ☐

Atoms have a positively charged nucleus. ☐

Mass is concentrated in the nucleus in the centre of atoms. ☐

Neutrons exist within the nucleus. ☐

Question 6 continues on the next page

5.1.1.3 The development of the model of the atom (common content with physics)

Question 01 · continued

0 6 . 2 The gold foil is:

- 4.00×10^{-7} metres thick
- 2400 atoms thick.

What is the diameter of one gold atom in metres?

Give your answer to 3 significant figures.

[3 marks]

Diameter of one gold atom (3 significant figures) = _____ m

5.1.1.3 The development of the model of the atom (common content with physics)

Question 01 · continued

0 6 . 3 Gold reacts with the elements in Group 7 of the periodic table.

0.175 g of gold reacts with chlorine.

The equation for the reaction is:

$$2\ Au + 3\ Cl_2 \rightarrow 2\ AuCl_3$$

Calculate the mass of chlorine needed to react with 0.175 g of gold.

Give your answer in mg

Relative atomic masses (A_r): Cl = 35.5 Au = 197

[5 marks]

Mass of chlorine = _____ mg

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5.1.1.3 The development of the model of the atom (common content with physics)

Question 02

November 2021 | 8464/C/1H | Original Q1

0 1 This question is about the periodic table.

0 1 . 1 **Figure 1** shows part of Mendeleev's version of the periodic table.

Figure 1

H							
Li	Be	B	C	N	O	F	
Na	Mg	Al	Si	P	S	Cl	
K Cu	Ca Zn		Ti	V As	Cr Se	Mn Br	Fe Co Ni
Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	I	Ru Rh Pd

Which group of elements had **not** been discovered when Mendeleev's version of the periodic table was published?

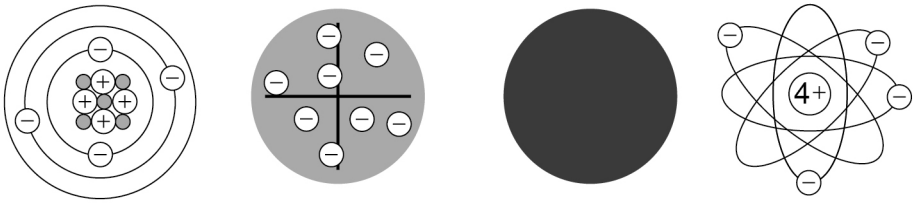
[1 mark]

5.1.1.3 The development of the model of the atom (common content with physics)

Question 02 · continued

Figure 2 represents different models of the atom.

Figure 2



A **B** **C** **D**

0 1 . 2 Which model represents the plum pudding model?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 1 . 3 Which model resulted from Chadwick's experimental work?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Question 1 continues on the next page

5.1.1.3 The development of the model of the atom (common content with physics)

Question 02 · continued

Potassium has different isotopes.

0 1 . 4 What is meant by 'isotopes'?

You should refer to subatomic particles.

[2 marks]

0 1 . 5 **Table 1** shows the mass numbers and the percentage abundance of two isotopes of potassium.

Table 1

Mass number	Percentage abundance
39	93.1
41	6.9

Calculate the relative atomic mass (A_r) of potassium.

Give your answer to 1 decimal place.

[3 marks]

Relative atomic mass (1 decimal place) = _____

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5.1.1.3 The development of the model of the atom (common content with physics)

Question 03

June 2025 | 8464/C/1H | Original Q3

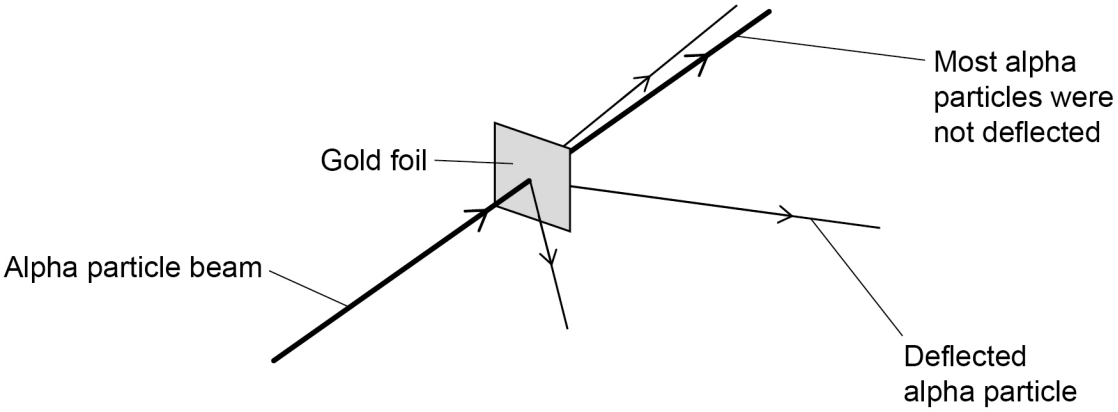
0 3 This question is about atoms, ions and elements.

0 3 . 1 **Figure 3** shows the results of the alpha particle scattering experiment.

In the experiment, alpha particles were fired at gold foil.

Alpha particles are positively charged.

Figure 3



What **two** conclusions were made from the results?

[2 marks]

Tick (✓) **two** boxes.

- Atoms are very small. ☐
- Atoms have a charged nucleus. ☐
- Electrons orbit the nucleus at specific distances. ☐
- Isotopes of an element have a different number of neutrons. ☐
- The mass of an atom is concentrated in the nucleus. ☐

5.1.1.3 The development of the model of the atom (common content with physics)

Question 03 · continued June 2025 | 8464/C/1H | Original Q3

Particle **X** consists of:

- 35 protons
- 44 neutrons
- 36 electrons.

0 3 . 2 Why is particle **X not** an atom?

Answer in terms of subatomic particles.

[1 mark]

0 3 . 3 Which is the correct representation of particle **X**?

Use the periodic table.

[1 mark]

Tick (✓) **one** box.

$^{79}_{35}Br^{+}$ ☐

$^{79}_{35}Br^{-}$ ☐

$^{79}_{35}Se^{+}$ ☐

$^{79}_{35}Se^{-}$ ☐

5.1.1.3 The development of the model of the atom (common content with physics)

Group 7 elements are known as the halogens.

0 3 . 4 **Table 2** shows the boiling points of some Group 7 elements.

Table 2

Element	Boiling point in °C
Fluorine	−188
Chlorine	−35
Bromine	59
Iodine	184

Explain the increase in the boiling points of the Group 7 elements going down the group.

[3 marks]

Question 3 continues on the next page

5.1.1.3 The development of the model of the atom (common content with physics)

Question 03 · continued

0 3 . 5 Chlorine reacts with fluorine to form a compound with the formula ClF_3

What is the type of bonding in the compound ClF_3?

[1 mark]

0 3 . 6 Chlorine reacts with a solution of sodium bromide.

Complete the word equation for the reaction.

[1 mark]

chlorine + sodium bromide ⟶ _____ + _____

0 3 . 7 Explain why Group 7 elements become less reactive going down the group.

[3 marks]

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