AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.1.3

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

Past-paper questions

Tier	**Foundation**
Question groups	**4**
Available paper years	**2018–2024**

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.

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

Question 01

June 2018 | 8462/1F | Original Q3

0 3 This question is about the structure of the atom.

0 3 . 1 Complete the sentences.

Choose answers from the box.

Each word may be used once, more than once, or not at all.

[5 marks]

electron	**ion**	**neutron**
nucleus	**proton**	

The centre of the atom is the _____.

The two types of particle in the centre of the atom are the proton and the _____.

James Chadwick proved the existence of the _____.

Niels Bohr suggested particles orbit the centre of the atom. This type of particle is the _____.

The two types of particle with the same mass are the neutron and the _____.

Table 2 shows information about two isotopes of element **X**.

Table 2

	Mass number	Percentage (%) abundance
Isotope 1	63	70
Isotope 2	65	30

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

Question 01 · continued June 2018 | 8462/1F | Original Q3

0 3 . 2 Calculate the relative atomic mass (A_r) of element **X** using the equation:

$$A_r = \frac{\text{(mass number} \times \text{percentage) of isotope 1 + (mass number} \times \text{percentage) of isotope 2}}{100}$$

Use **Table 2**.

Give your answer to 1 decimal place.

[2 marks]

A_r = _____

0 3 . 3 Suggest the identity of element **X**.

Use the periodic table.

[1 mark]

Element **X** is _____

0 3 . 4 The radius of an atom of element **X** is 1.2×10^{-10} m

The radius of the centre of the atom is $\frac{1}{10\,000}$ the radius of the atom.

Calculate the radius of the centre of an atom of element **X**.

Give your answer in standard form.

[2 marks]

Radius = _____ m

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

Question 02

November 2020 | 8462/1F | Original Q2

0 2 This question is about models of the atom.

0 2 . 1 Atoms were first thought to be tiny spheres that could not be divided.

Which particle was discovered to change this model of the atom?

[1 mark]

Tick (✓) **one** box.

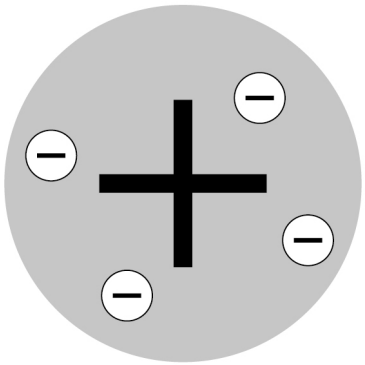
Electron ☐

Neutron ☐

Proton ☐

0 2 . 2 **Figure 2** shows another model of the atom.

Figure 2



What is the name of this model of the atom?

[1 mark]

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

Question 02 · continued

0 2 . 3 A scientist fired particles at gold atoms.

Some of these particles were scattered.

The results led to a different model of the atom.

Which type of particle was fired at the gold atoms?

[1 mark]

Tick (✓) **one** box.

- Alpha ☐
- Electron ☐
- Neutron ☐
- Proton ☐

0 2 . 4 Which scientist first suggested that electrons orbit the nucleus at specific distances?

[1 mark]

Tick (✓) **one** box.

- Bohr ☐
- Chadwick ☐
- Mendeleev ☐

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

Question 02 · continued

0 2 . 5 The model of the atom used today has three subatomic particles:

- electrons
- neutrons
- protons.

Complete the sentences.

[3 marks]

Atoms of the same element have the same atomic number because they have the same number of _____.

Atoms of the same element can have different mass numbers because they have different numbers of _____.

Atoms have no overall charge because they have the same number of _____ and _____.

0 2 . 6 The radius of a nucleus is approximately 1×10^{-14} m

The radius of an atom is approximately 1×10^{-10} m

A teacher uses a ball of radius 1 cm to represent the nucleus.

What could represent the atom on the same scale?

[1 mark]

Tick (✓) **one** box.

- A ball of radius 10 cm ☐
- A sports arena of radius 100 m ☐
- An island of radius 10 km ☐
- A planet of radius 1000 km ☐

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

Question 03

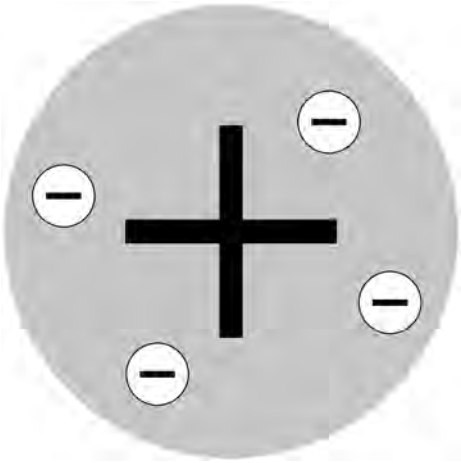
0 9 Discoveries in chemistry led to a better understanding of atomic structure.

0 9 . 1 Atoms were originally thought to be tiny spheres that could not be divided.

The plum pudding model of the atom was then developed.

Figure 10 represents the plum pudding model of the atom.

Figure 10



Describe the plum pudding model of the atom.

[2 marks]

0 9 . 2 Atoms contain electrons, neutrons and protons.

Write these three particles in order of their discovery.

[1 mark]

Earliest _____

_____

Latest _____

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

Question 03 · continued

Very few atoms of the element tennessine (Ts) have ever been identified.

The atomic number of tennessine is 117

0 9 . 3 Predict the number of outer shell electrons in an atom of tennessine.

Give **one** reason for your answer.

Use the periodic table.

[2 marks]

Number of outer shell electrons _____

Reason _____

_____

0 9 . 4 Tennessine was first identified by a small group of scientists in 2010.

Suggest **one** reason why tennessine was **not** accepted as a new element by other scientists until 2015.

[1 mark]

_____

_____

Question 9 continues on the next page

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

0 9 . 5 The discovery of isotopes explained why some relative atomic masses are not whole numbers.

Element **R** has two isotopes.

Table 5 shows the mass numbers and percentage abundances of the isotopes of element **R**.

Table 5

Mass number	Percentage abundance (%)
6	7.6
7	92.4

Calculate the relative atomic mass (A_r) of element **R**.

Give your answer to 1 decimal place.

[3 marks]

Relative atomic mass (1 decimal place) = _____

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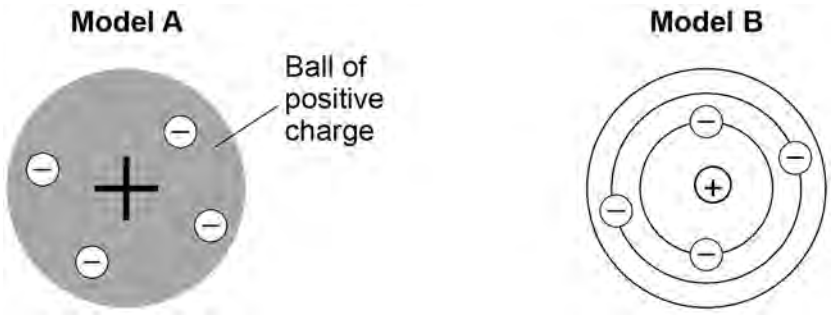
4.1.1.3 The development of the model of the atom (common content with physics)

Question 04

1 0 This question is about models of the atom.

Figure 16 shows two early models of the atom.

Figure 16



1 0 . 1 Name the models of the atom shown in **Figure 16**.

[2 marks]

Model **A** _____

Model **B** _____

1 0 . 2 Compare model **A** with the model of the atom used today.

Use **Figure 16**.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

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

Question 04 · continued

1 0 . 3 Chadwick's experiments showed the existence of neutrons in an atom.

This led to an understanding of isotopes.

Define the term 'isotopes'.

Refer to subatomic particles in your answer.

[2 marks]

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