AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.1.1.5

Size and mass of atoms

Past-paper questions

Tier	**Foundation**
Question groups	**5**
Available paper years	**2021–2025**

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.

5.1.1.5 Size and mass of atoms

Question 01

November 2021 | 8464/C/1F | Original Q3

0 3 Carbon can exist in a number of different structures.

0 3 . 1 What is the approximate radius of a carbon atom?

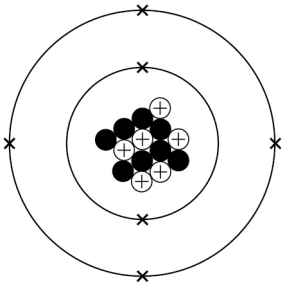
[1 mark]

Tick (✓) **one** box.

0.1 m ☐ 0.1 mm ☐ 0.1 nm ☐

0 3 . 2 **Figure 3** shows an atom of carbon.

Figure 3



Describe the atomic structure of this carbon atom.

You should include the number of electrons, neutrons and protons.

[6 marks]

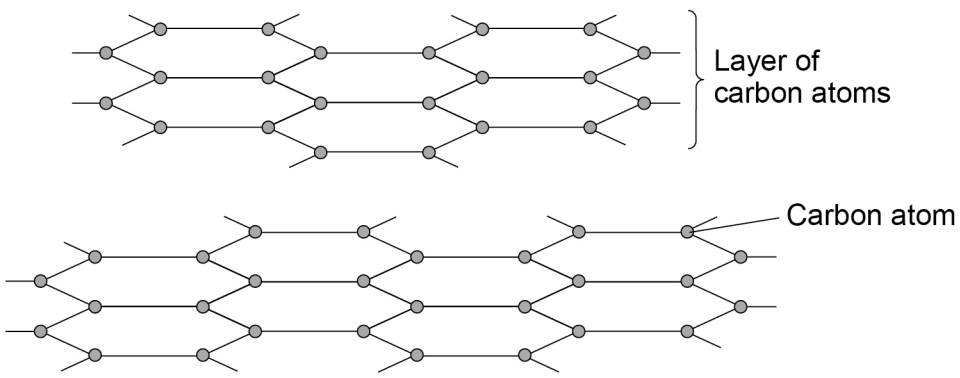
5.1.1.5 Size and mass of atoms

Question 01 · continued

In graphite the carbon atoms are held together by bonds.

Figure 4 represents part of the structure of graphite.

Figure 4



0 3 . 3 How many bonds does each carbon atom have in graphite?

Use **Figure 4**.

[1 mark]

Tick (✓) **one** box.

1 ☐ 2 ☐ 3 ☐ 4 ☐

0 3 . 4 What type of bonds hold the carbon atoms together in graphite?

[1 mark]

Tick (✓) **one** box.

Covalent ☐

Ionic ☐

Metallic ☐

5.1.1.5 Size and mass of atoms

Question 01 · continued

0 3 . 5 Lubricants allow objects to slide over each other easily.

Suggest why graphite can be used as a lubricant.

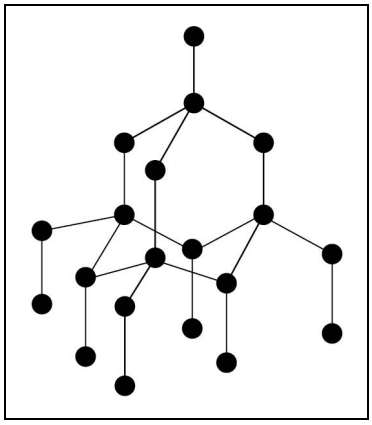
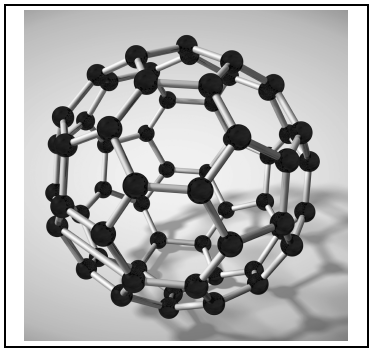
Use **Figure 4**.

[1 mark]

0 3 . 6 The two structures represent different forms of carbon.

Draw **one** line from each structure to the form of carbon.

[2 marks]

Structure	Form of carbon
	Buckminsterfullerene
	Diamond
	Graphene
	Nanotube

12

5.1.1.5 Size and mass of atoms

Question 02

November 2021 | 8464/C/1F | Original Q6

0 6 This question is about the periodic table.

0 6 . 1 **Figure 11** shows part of Mendeleev's version of the periodic table.

Figure 11

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?

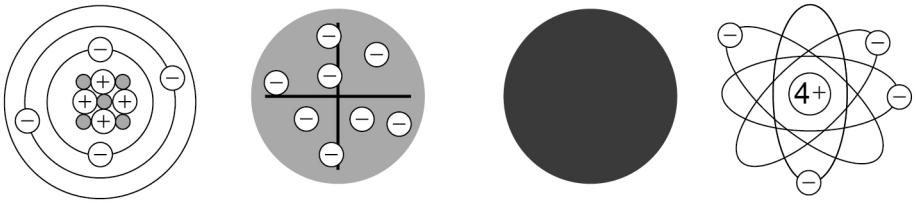
[1 mark]

5.1.1.5 Size and mass of atoms

Question 02 · continued

Figure 12 represents different models of the atom.

Figure 12



A B C D

0 6 . 2 Which model represents the plum pudding model?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☐

0 6 . 3 Which model resulted from Chadwick's experimental work?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☐

Question 6 continues on the next page

Potassium has different isotopes.

0 6 . 4 What is meant by 'isotopes'?

You should refer to subatomic particles.

[2 marks]

0 6 . 5 **Table 2** shows the mass numbers and the percentage abundance of two isotopes of potassium.

Table 2

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) = _____

8

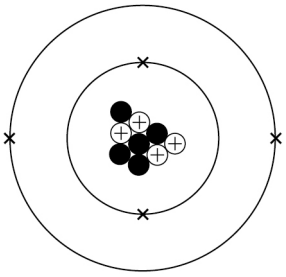
5.1.1.5 Size and mass of atoms

Question 03

0 1 All substances are made from atoms.

0 1 . 1 **Figure 1** represents a beryllium atom.

Figure 1



What is the number of protons and the number of neutrons in the beryllium atom?

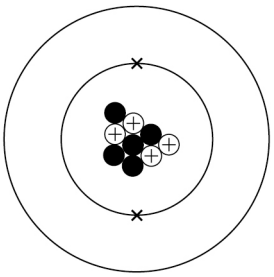
[2 marks]

Number of protons _____

Number of neutrons _____

0 1 . 2 **Figure 2** represents a beryllium **ion**.

Figure 2



What is the relative charge on a beryllium ion?

[1 mark]

Tick (✓) **one** box.

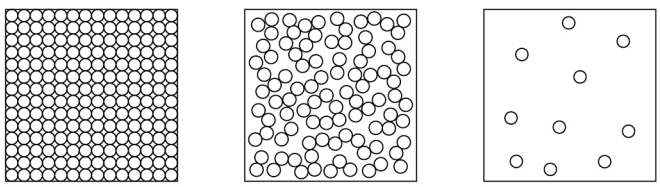
0 ☐ +1 ☐ +2 ☐

5.1.1.5 Size and mass of atoms

Question 03 · continued

Figure 3 shows the arrangement of atoms in the three states of matter.

Figure 3



A **B** **C**

0 1 . 3 What state of matter is represented by state **C** in **Figure 3**?

[1 mark]

Tick (✓) **one** box.

Gas ☐

Liquid ☐

Solid ☐

5.1.1.5 Size and mass of atoms

Question 03 · continued

0 1 . 4 What is the name of the process when state **B** changes into state **A**?

Use **Figure 3**.

[1 mark]

Tick (✓) **one** box.

Condensing ☐

Freezing ☐

Melting ☐

0 1 . 5 How can state **B** be changed into state **C**?

Use **Figure 3**.

[1 mark]

Question 1 continues on the next page

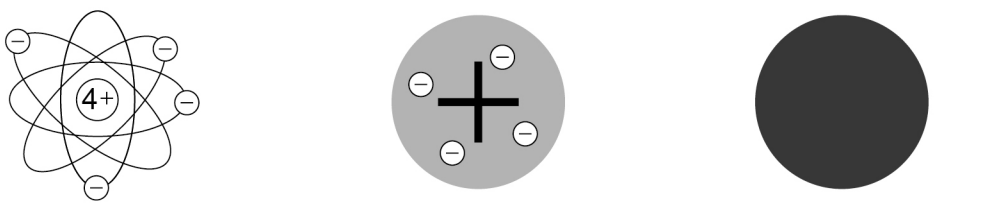
5.1.1.5 Size and mass of atoms

Question 03 · continued

Experimental evidence led to the scientific model of the atom changing over time.

0 1 . 6 **Figure 4** shows three models for the atom.

Figure 4

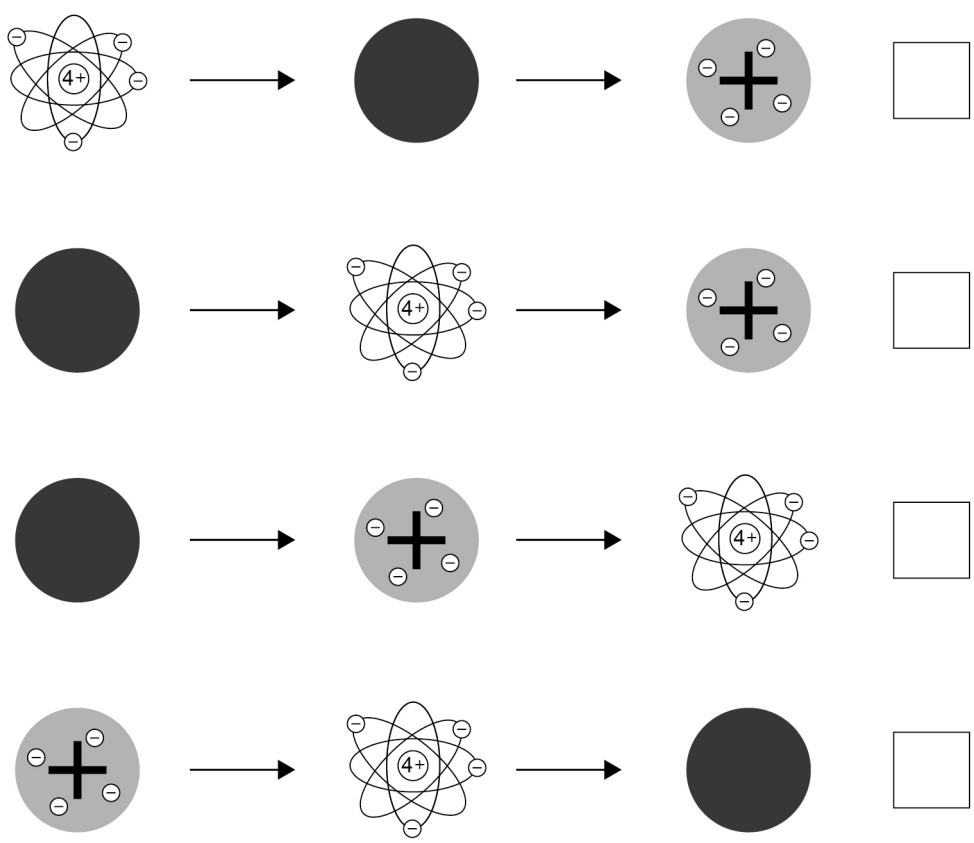


Nuclear model **Plum pudding model** **Tiny spheres model**

What is the order for the development of the model of the atom?

[1 mark]

Tick (✓) **one** box.



5.1.1.5 Size and mass of atoms

Question 03 · continued

0 1 . 7 Complete the sentence.

Choose the answer from the box.

[1 mark]

Bohr	**Chadwick**	**Mendeleev**

The existence of neutrons was discovered by _____.

8

Turn over for the next question

5.1.1.5 Size and mass of atoms

Question 04

June 2024 | 8464/C/1F | Original Q1

0 1 Potassium is in Group 1 of the periodic table.

0 1 . 1 What name is given to Group 1 elements?

[1 mark]

Tick (✓) **one** box.

- Alkali metals ☐
- Halogens ☐
- Noble gases ☐

0 1 . 2 A potassium atom is very small.

What is the radius of a potassium atom?

[1 mark]

Tick (✓) **one** box.

- 0.2 cm ☐
- 0.2 mm ☐
- 0.2 nm ☐

0 1 . 3 What name is given to the number of protons in an atom?

[1 mark]

Tick (✓) **one** box.

- Atomic number ☐
- Group number ☐
- Mass number ☐

Question 04 · continued

0 1 . 4 **Table 1** shows the name and the relative charge of the particles in a potassium atom.

Table 1

Name of particle	Relative charge
Proton	
	0
Electron	–1

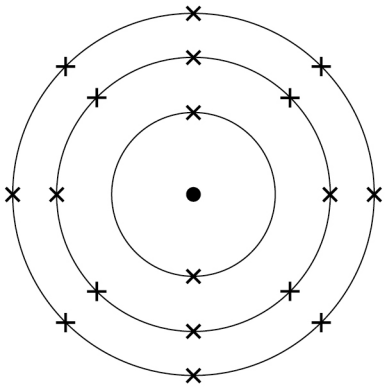
Complete **Table 1**.

[2 marks]

0 1 . 5 The electronic structure of a potassium atom is 2,8,8,1

Figure 1 represents the electronic structure of a potassium **ion**.

Figure 1



What is the charge on a potassium **ion**?

[1 mark]

Tick (✓) **one** box.

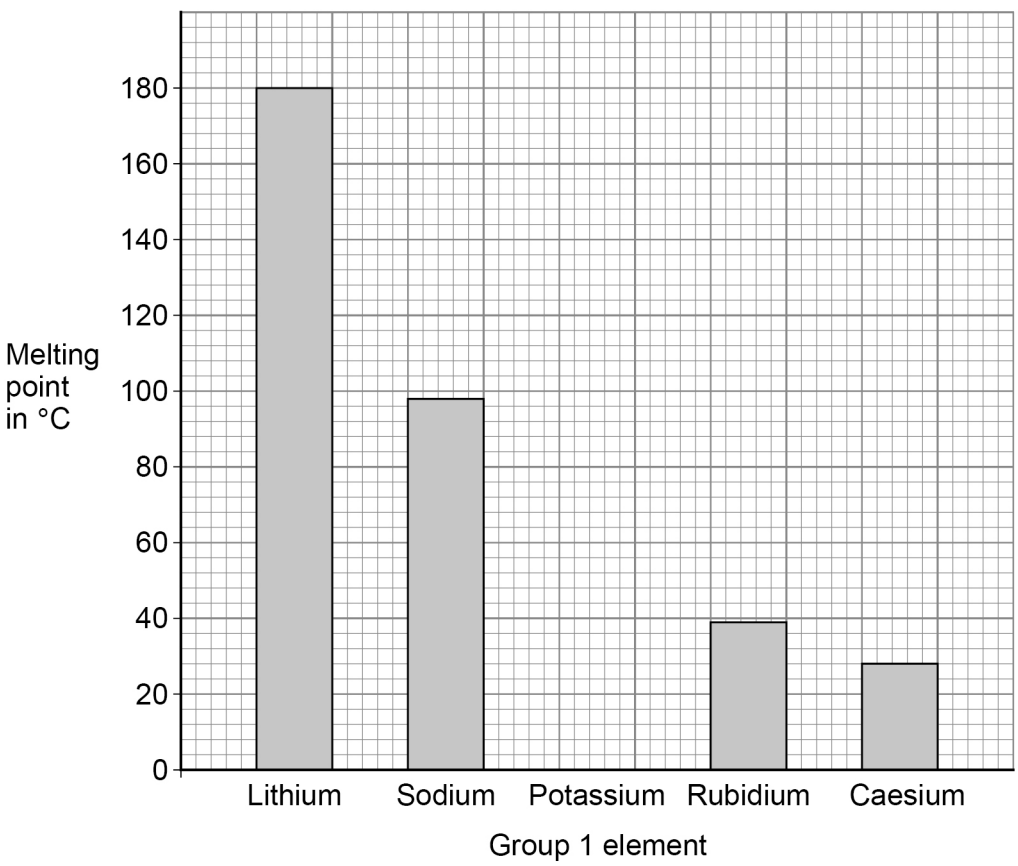
–1 ☐ 0 ☐ +1 ☐

5.1.1.5 Size and mass of atoms

Question 04 · continued

0 1 . 6 **Figure 2** shows the melting points of some Group 1 elements.

Figure 2



Predict the melting point of potassium.

[1 mark]

Melting point = _____ °C

5.1.1.5 Size and mass of atoms

Question 04 · continued

0 1 . 7 Potassium has two isotopes.

Table 2 shows the percentage (%) abundance of the two isotopes.

Table 2

Isotope	Percentage (%) abundance
$^{39}_{19}K$	93
$^{41}_{19}K$	7

How is the relative atomic mass (A_r) of potassium calculated?

[1 mark]

Tick (✓) **one** box.

$A_r = \dfrac{(39 \times 7) + (41 \times 93)}{100}$ ☐

$A_r = \dfrac{(39 \times 93) + (41 \times 7)}{100}$ ☐

$A_r = \dfrac{(39 \times 41) + (93 \times 7)}{100}$ ☐

8

5.1.1.5 Size and mass of atoms

Question 05

June 2025 | 8464/C/1F | Original Q1

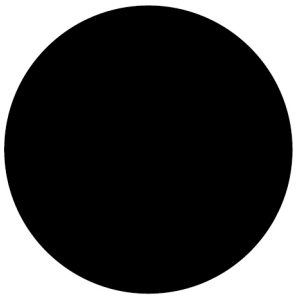
0 1 This question is about atoms and ions.

The model of the atom has changed over time.

0 1 . 1 In an early model, scientists thought the atom was a tiny sphere that could **not** be divided.

Figure 1 represents this early model of the atom.

Figure 1



The discovery of a subatomic particle led to a change in the model in **Figure 1**.

Which was the first subatomic particle to be discovered?

[1 mark]

Tick (✓) **one** box.

Electron ☐

Neutron ☐

Proton ☐

Question 05 · continued

0 1 . 2 In a later model of the atom, most of the mass was concentrated in the centre of the atom.

What is the name of the centre of an atom?

[1 mark]

_____

0 1 . 3 Atoms contain three types of subatomic particle.

Draw **one** line from each subatomic particle to the relative charge of the particle.

[2 marks]

Subatomic particle	Relative charge of the particle
Electron	+1
Neutron	0
Proton	–1

0 1 . 4 What is meant by the 'atomic number of an atom'?

[1 mark]

Tick (✓) **one** box.

- The number of neutrons only ☐
- The number of protons only ☐
- The number of neutrons + the number of protons ☐

Question 1 continues on the next page

0 1 . 5 **Table 1** shows information about two isotopes of an element.

Table 1

	Mass number	Percentage (%) abundance
Isotope **A**	10	19.7
Isotope **B**	11	80.3

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

Use the equation:

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

Give your answer to 1 decimal place.

[3 marks]

A_r (1 decimal place) = _____

5.1.1.5 Size and mass of atoms

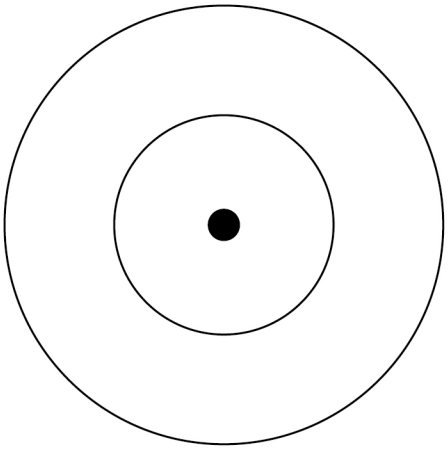
Question 05 · continued

0 1 . 6 An oxygen atom has eight electrons.

Complete **Figure 2** to show the electronic structure of an oxygen atom.

[1 mark]

Figure 2



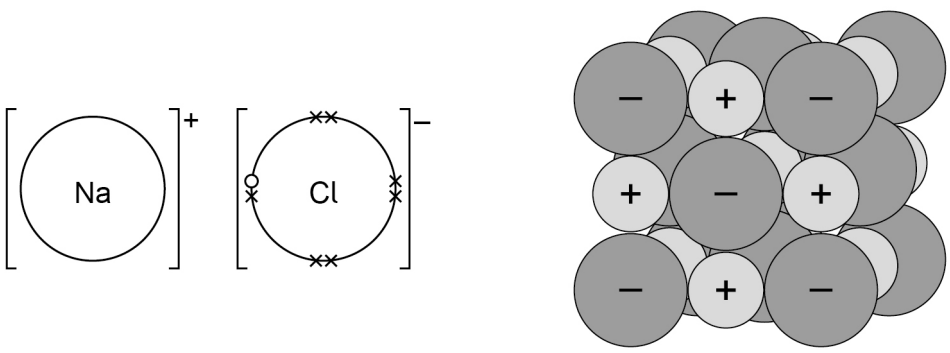
Question 1 continues on the next page

5.1.1.5 Size and mass of atoms

Question 05 · continued

0 1 . 7 **Figure 3** represents two models of sodium chloride.

Figure 3



Model **A**

Model **B**

What are **two** advantages of model **B** compared with model **A**?

[2 marks]

Tick (✓) **two** boxes.

Model **B** shows the 3D arrangement of the ions. ☐

Model **B** shows the charges on the ions. ☐

Model **B** shows the electronic structures of the ions. ☐

Model **B** shows the relative sizes of the ions. ☐

Model **B** shows which elements are present. ☐

11