AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.1.2.6

# Group 7

## Past-paper questions

| | |
|---|---|
| Tier | **Higher** |
| Question groups | **8** |
| Available paper years | **2018–2025** |

## 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.

5.1.2.6 Group 7

Question 01

June 2018 | 8464/C/1H | Original Q4

**0 4** This question is about the halogens.

**0 4 . 1** Write the state symbol for chlorine at room temperature.

**[1 mark]**

$Cl_2$ ( _____ )

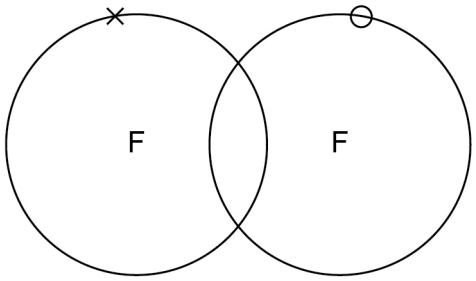
**0 4 . 2** **Figure 4** represents one molecule of fluorine.

Complete the dot and cross diagram on **Figure 4**

You should show only the electrons in the outer shells.

**[2 marks]**

**Figure 4**




**0 4 . 3** A fluorine atom can be represented as $^{19}_{9}F$

What is the total number of electrons in a fluorine molecule ($F_2$)?

**[1 mark]**

Tick **one** box.

9 ☐ 14 ☐ 18 ☐ 38 ☐

**0 4 . 4** Aluminium reacts with bromine to produce aluminium bromide.

Complete the balanced chemical equation for this reaction.

**[2 marks]**

_____ Al + _____ $Br_2$ → 2 _____

5.1.2.6 Group 7

Question 01 · continued



**0 4 . 5** When chlorine reacts with potassium bromide, chlorine displaces bromine.

$$Cl_2 + 2\,KBr \rightarrow Br_2 + 2\,KCl$$

Explain why chlorine is more reactive than bromine.

**[3 marks]**

9

5.1.2.6 Group 7

Question 02



**0 4** This question is about elements in the periodic table.

**0 4 . 1** What order did scientists use to arrange elements in early periodic tables?

**[1 mark]**

**0 4 . 2** In the early periodic tables some elements were placed in the wrong groups.

Mendeleev overcame this in his periodic table.

Give **one** way Mendeleev did this.

**[1 mark]**

**Question 4 continues on the next page**

5.1.2.6 Group 7

Question 02 · continued



**Table 2** shows the boiling points of fluorine, chlorine and bromine.

**Table 2**

| Element | Boiling point in °C |
|---|---|
| Fluorine | –186 |
| Chlorine | –34 |
| Bromine | +59 |

**0 4 . 3** Explain why the boiling points in **Table 2** are low.

**[2 marks]**

**0 4 . 4** Explain the trend in the boiling points in **Table 2**.

**[3 marks]**

5.1.2.6 Group 7

**Question 02 · continued**



**0 4 . 5** Explain why neon is unreactive.

Give the electronic structure of neon in your answer.

**[2 marks]**

**0 4 . 6** How many atoms are there in 1 g of argon?

The Avogadro constant is $6.02 \times 10^{23}$ per mole.

Relative atomic mass ($A_r$): Ar = 40

**[2 marks]**

Number of atoms in 1 g = _____

**11**

5.1.2.6 Group 7

Question 03

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

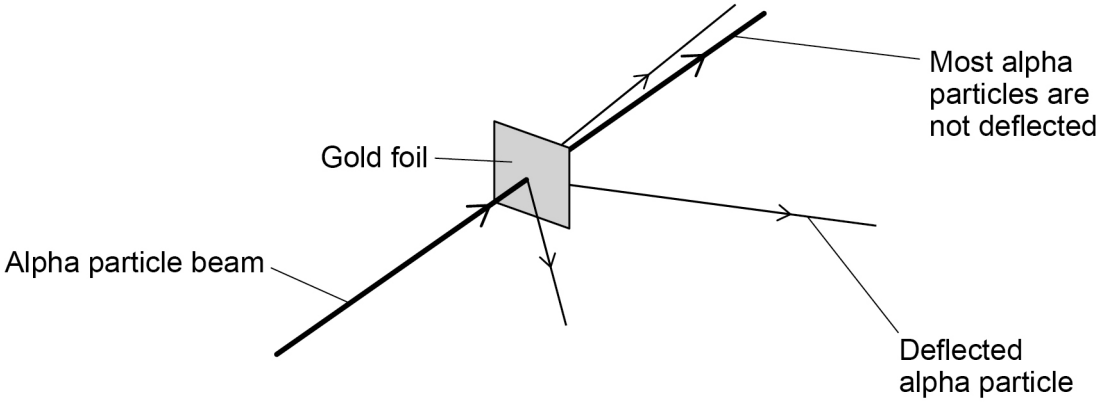
**0 6** This question is about gold and compounds of gold.

**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**

5.1.2.6 Group 7

Question 03 · continued



**0 6 . 2** The gold foil is:

- $4.00 \times 10^{-7}$ 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

5.1.2.6 Group 7

Question 03 · 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

10

5.1.2.6 Group 7

Question 04

November 2020 | 8464/C/1H | Original Q7

**0 7** This question is about elements.

Caesium is in Group 1 of the periodic table.

**0 7 . 1** Explain what happens to caesium atoms and to oxygen atoms when caesium reacts with oxygen to produce caesium oxide.

You should answer in terms of electrons.

**[4 marks]**

**0 7 . 2** Explain why caesium is more reactive than sodium.

You should answer in terms of electrons.

**[4 marks]**

5.1.2.6 Group 7

Question 04 · continued



**0 7 . 3** **Figure 6** shows part of Mendeleev's periodic table.

**Figure 6**

| | |
|---|---|
| 16<br>**O** | 19<br>**F** |
| 32<br>**S** | 35.5<br>**Cl** |
| 79<br>**Se** | 80<br>**Br** |
| 128<br>**Te** | 127<br>**I** |

Explain why the early periodic tables placed iodine (I) before tellurium (Te), but then Mendeleev placed tellurium before iodine.

**[3 marks]**

11

5.1.2.6 Group 7

Question 05



**0 4** This question is about Group 7 elements.

**0 4 . 1** What are the Group 7 elements known as?

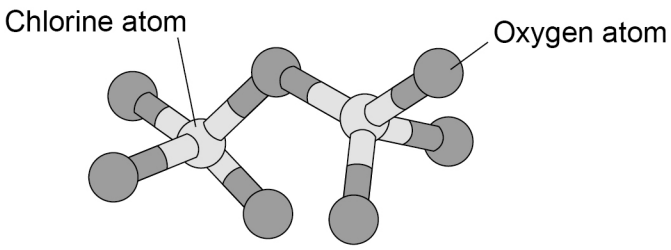
**[1 mark]**

**0 4 . 2** Why do Group 7 elements react in similar ways?

**[1 mark]**

**0 4 . 3** **Figure 3** shows the structure of a molecule of chlorine oxide.

**Figure 3**




What is the molecular formula of the chlorine oxide molecule in **Figure 3**?

**[1 mark]**

**Question 4 continues on the next page**

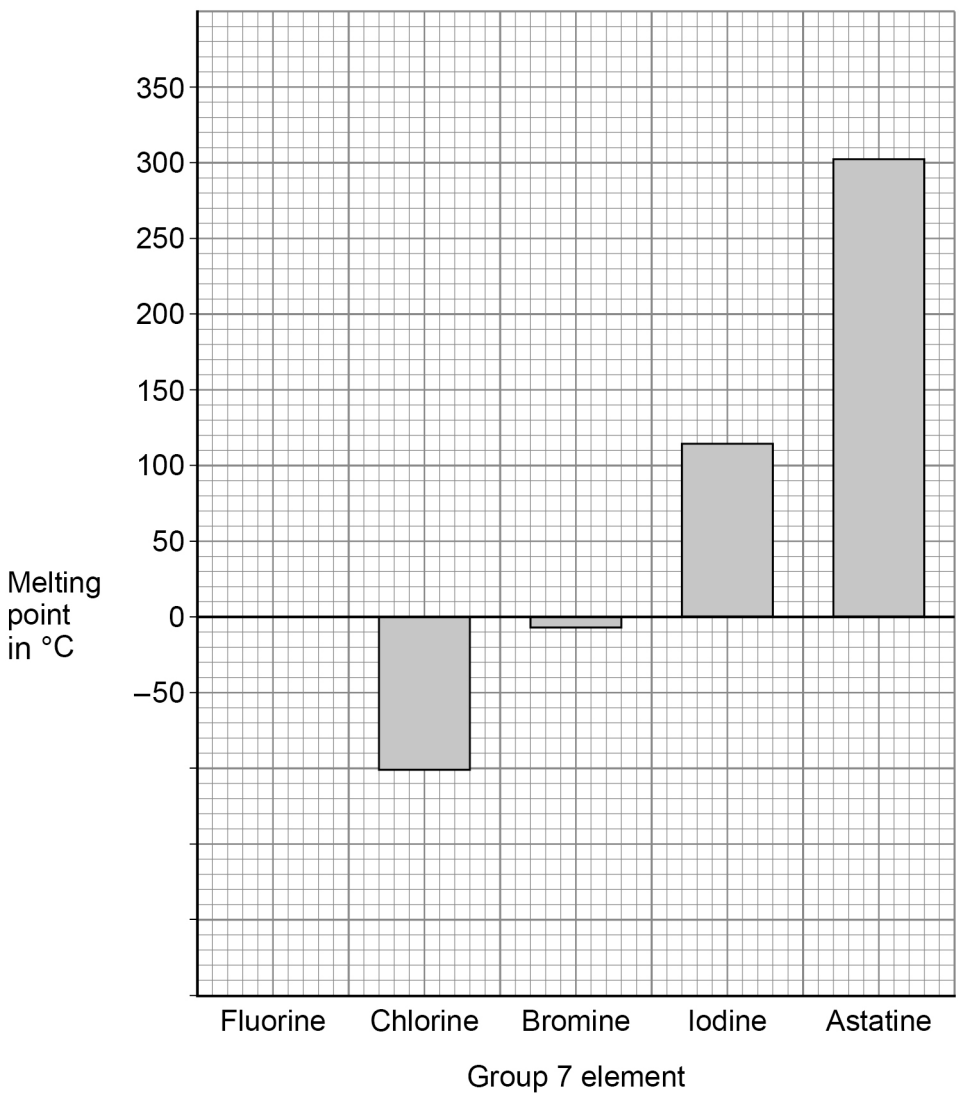
5.1.2.6 Group 7

Question 05 · continued



**Figure 4** shows the melting points of some Group 7 elements.

**Figure 4**




**0 4 . 4** The melting point of fluorine is –220 °C

Complete **Figure 4**.

You should:

- complete the scale on the y-axis
- draw the bar for the melting point of fluorine.

**[2 marks]**

5.1.2.6 Group 7

Question 05 · continued



**0 4 . 5** Explain the trend in the melting points of the Group 7 elements.

Use **Figure 4**.

**[3 marks]**

**0 4 . 6** What is the state symbol for bromine at –50 °C?

Use **Figure 4**.

**[1 mark]**

Tick (✓) **one** box.

(aq) ☐ (g) ☐ (l) ☐ (s) ☐

**0 4 . 7** Evaporation and boiling occur at the surface of bromine at its boiling point.

Name **one** more process that happens at the surface of bromine at its boiling point.

**[1 mark]**

**10**

5.1.2.6 Group 7

Question 06



**0 4** Group 7 elements are known as the halogens.

All atoms of Group 7 elements contain protons, neutrons and electrons.

**0 4 . 1** What is the order of discovery of the proton, neutron and electron?

**[1 mark]**

Tick (✓) **one** box.

electron → neutron → proton ☐

electron → proton → neutron ☐

neutron → proton → electron ☐

proton → electron → neutron ☐

**0 4 . 2** **Table 1** shows the mass of a proton and of an electron.

**Table 1**

| Name of particle | Mass in kg |
|---|---|
| Proton | $1.673 \times 10^{-27}$ |
| Electron | $9.109 \times 10^{-31}$ |

Calculate how many times heavier a proton is than an electron.

**[2 marks]**

Times heavier a proton is than an electron = _____

A bromine atom can be represented as $^{81}_{35}Br$.

**0 4 . 3** What is the number of neutrons in this bromine atom?

**[1 mark]**

**0 4 . 4** What is the number of electrons in a bromide **ion**?

**[1 mark]**

**0 4 . 5** Chlorine has two isotopes.

**Table 2** shows the percentage abundance of the two isotopes of chlorine.

**Table 2**

| Isotope | Percentage (%) abundance |
|---|---|
| $^{35}_{17}Cl$ | 75.77 |
| $^{37}_{17}Cl$ | 24.23 |

Calculate the relative atomic mass ($A_r$) of chlorine.

Give your answer to 2 decimal places.

**[3 marks]**

Relative atomic mass (2 decimal places) = _____

5.1.2.6 Group 7

Question 06 · continued

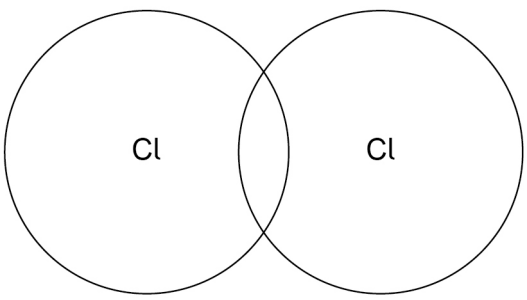


**0 4 . 6** **Figure 4** shows the outer shells in one molecule of chlorine ($Cl_2$).

Complete the dot and cross diagram to show the electrons in the outer shells.

**[2 marks]**

**Figure 4**




10

### 5.1.2.6 Group 7

**Question 07**

June 2024 | 8464/C/1H | Original Q7

**0 7** Halogens are elements in Group 7 of the periodic table.

**0 7 . 1** Calcium reacts with chlorine to produce calcium chloride.

Explain what happens to calcium atoms and to chlorine atoms when calcium reacts with chlorine to produce calcium chloride.

**[4 marks]**

**0 7 . 2** Explain why chlorine is more reactive than bromine.

**[4 marks]**

5.1.2.6 Group 7

Question 07 · continued



**0 7 . 3** **Table 4** shows the boiling points of four hydrogen halides.

**Table 4**

| Hydrogen halide | Boiling point in °C |
|---|---|
| HF | 20 |
| HCl | –85 |
| HBr | –67 |
| HI | –35 |

Describe how the boiling points of the hydrogen halides change as the relative formula mass changes.

**[2 marks]**

10

5.1.2.6 Group 7

Question 08

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

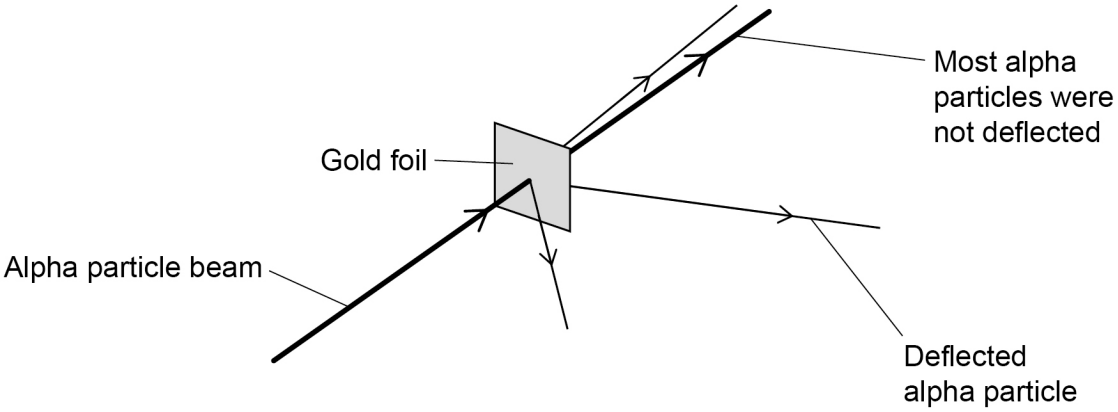
**0 3** This question is about atoms, ions and elements.

**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. ☐

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.

$^{79}_{35}Br^{+}$ ☐

$^{79}_{35}Br^{-}$ ☐

$^{79}_{35}Se^{+}$ ☐

$^{79}_{35}Se^{-}$ ☐

5.1.2.6 Group 7

Question 08 · continued



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**

5.1.2.6 Group 7

**Question 08 · 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]**

12