The Periodic Table

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.1 Atomic Structure and the Periodic Table
Sub-Topic	The Periodic Table
Difficulty Level	Bronze Level
Booklet	Question Paper 1

Time Allowed: **58 minutes**

Score: **/55**

Percentage: **/100**

Grade Boundaries:

Q1. John Newlands arranged the known elements into a table in order of atomic weight.

Figure 1 shows part of Newlands' table.

Figure 1

Group	**1**	**2**	**3**	**4**	**5**	**6**	**7**
	H	Li	Be	B	C	N	O
	F	Na	Mg	Al	Si	P	S
	Cl	K	Ca				

(a) What are the names of the elements in Group 5 of Newlands' table?

Tick **one** box.

Calcium and sulfur ☐

Carbon and silicon ☐

Chlorine and silver ☐

Chromium and tin ☐

(1)

(b) In what order is the modern periodic table arranged?

Tick **one** box.

Atomic mass ☐

Atomic number ☐

Atomic size ☐

Atomic weight ☐

(1)

(c) Give **two** differences between Group 1 of Newlands' table and Group 1 of the periodic table.

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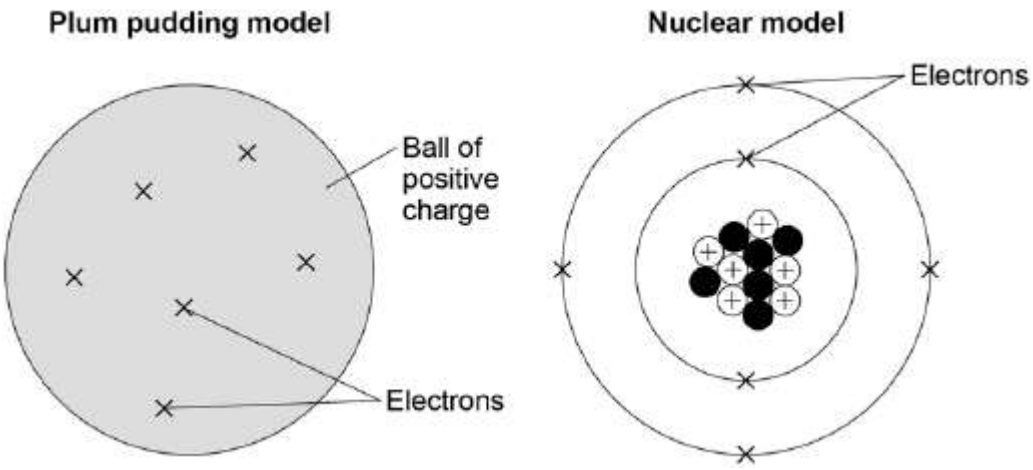
(2)

(d) In 1864, atoms were thought to be particles that could not be divided up into smaller particles.

By 1898, the electron had been discovered and the plum pudding model of an atom was proposed.

Figure 2 shows the plum pudding model of an atom of carbon and the nuclear model of an atom of carbon.

Figure 2



Compare the position of the subatomic particles in the plum pudding model with the nuclear model.

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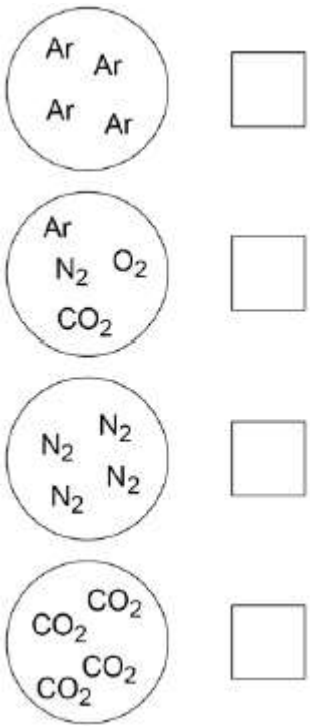
(4)

(e) Models are used to show the differences between elements, compounds and mixtures.

Which circle shows a model of a mixture?

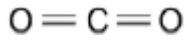
Tick **one** box.



(1)

(f) **Figure 3** shows a model of carbon dioxide.

Figure 3



What does each line between the atoms in **Figure 3** represent?

Tick **one** box.

Covalent bond ☐

Intermolecular force ☐

Ionic bond ☐

Metallic bond ☐

(1)
(Total 10 marks)

Q2. The three states of matter are solid, liquid and gas.

(a) Lithium reacts with water to produce lithium hydroxide solution and hydrogen.

Use the correct state symbols from the box to complete the chemical equation.

aq	g
l	s

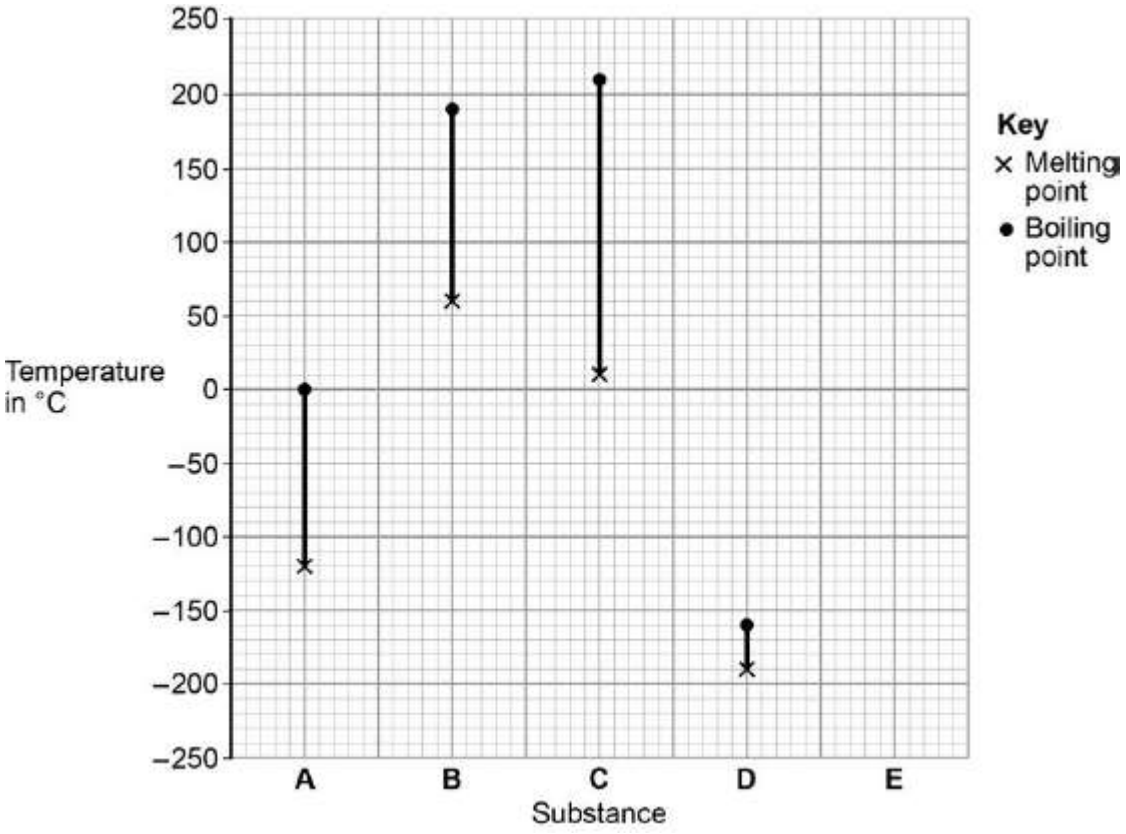
$2Li(s) + 2H_2O(l) \rightarrow 2LiOH(.....) + H_2(.....)$

lithium + water → lithium hydroxide + hydrogen

(2)

(b) **Figure 1** shows the melting points and the boiling points of four substances, **A**, **B**, **C** and **D**.

Figure 1



Which substance is liquid over the greatest temperature range?

Tick **one** box.

A ☐

B ☐

C ☐

D ☐

(1)

(c) Which **two** substances are gases at 50 °C?

Tick **one** box.

A and **B** ☐

B and **C** ☐

C and **D** ☐

A and **D** ☐

(1)

(d) A different substance, **E**, has:

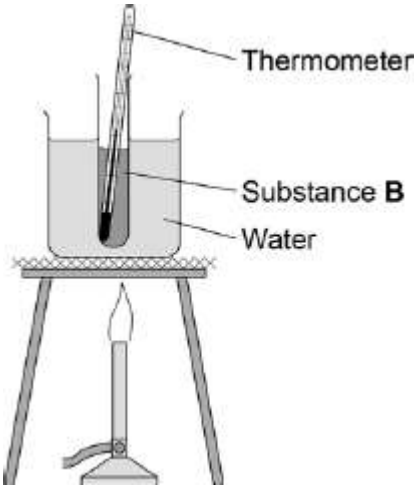
- a melting point of −50 °C
- a boiling point of +120 °C

Plot these two values on **Figure 1**.

(2)

(e) **Figure 2** shows the apparatus a student used to determine the melting point and the boiling point of substance **B** in **Figure 1**.

Figure 2



Explain why the student could not use this apparatus to determine the boiling point of substance **B**.

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(2)

(f) Suggest **one** reason why the student could not use this apparatus to determine the exact melting point of substance **B**.

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(1)
(Total 9 marks)

Q3. This question is about drinking water.

(a) Name **two** methods of treating water from rivers, lakes or the sea to produce drinking water.

Tick **two** boxes.

Anaerobic digestion	☐
Cracking	☐
Desalination	☐
Electrolysis	☐
Sterilising	☐

(2)

(b) The table below shows the amounts of dissolved ions in a sample of drinking water.

Dissolved ion	Mass in mg per dm^3
Cl^-	250
Na^+	200
NO_3^+	40

What is the name of the ion with the symbol Cl^-?

Tick **one** box.

Calcium ion ☐

Carbonate ion ☐

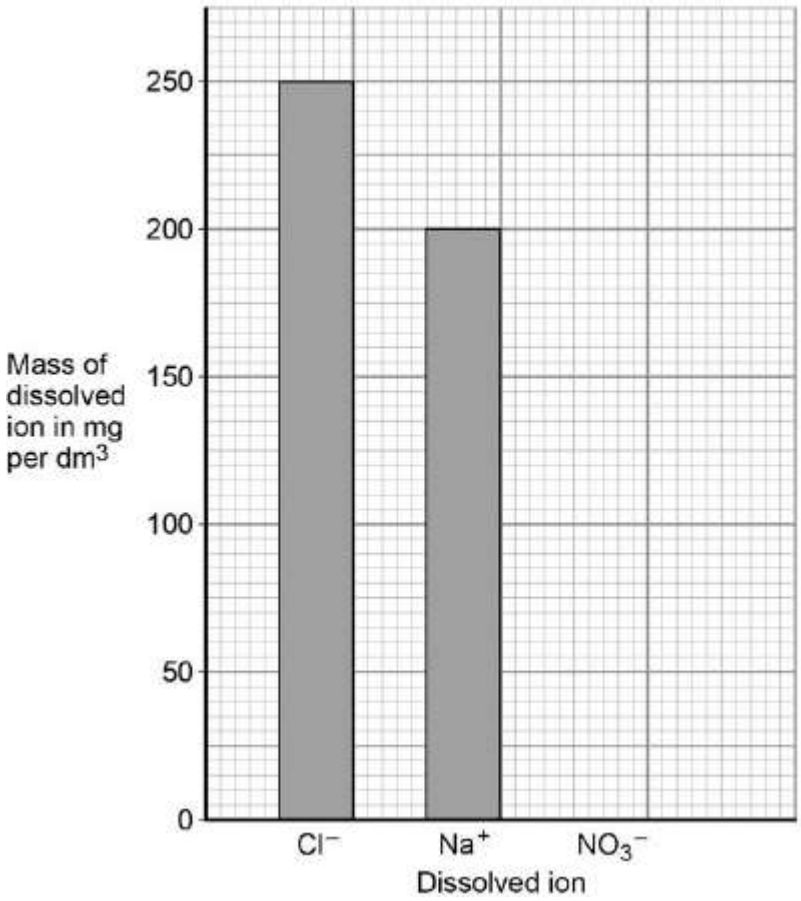
Chloride ion ☐

Chlorine ion ☐

(1)

(c) Use the information in the table above to complete the bar chart in **Figure 1**.

Figure 1



(1)

(d) Look at the questions labelled **A, B, C, D**.

A How many substances are there in drinking water?

B How much fluoride is in drinking water?

C Is fluoride soluble in drinking water?

D Should fluoride be added to drinking water?

Which **one** of the questions cannot be answered by science alone?

Tick **one** box.

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

(1)

(e) Give **two** reasons why the answer you have chosen cannot be answered by science

alone.

1 .....

.....

2 .....

.....

(2)

(f) A sample of drinking water contains 1.5 mg of fluoride per dm^3 of water.
A person drinks 1 dm^3 of this water.

The recommended daily amount of fluoride is 4.0 mg.

Which calculation gives the percentage of the recommended daily amount of fluoride in 1 dm^3 of this water?

Tick **one** box.

$\frac{1.5}{4.0} \times 100$ ☐

$\frac{1.5}{100} \times 4.0$ ☐

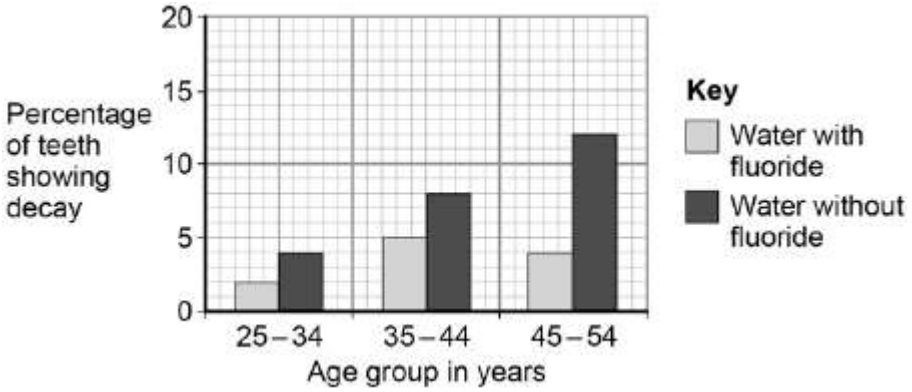
$\frac{4.0}{1.5} \times 100$ ☐

$\frac{100}{1.5} \times 4.0$ ☐

(1)

(g) **Figure 2** shows the effect of fluoride in drinking water on tooth decay in different age groups.

Figure 2



Describe the pattern of tooth decay in **Figure 2** for water without fluoride.

Use data to justify your answer.

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(2)

(h) Describe the effect of adding fluoride to drinking water for the age groups in **Figure 2**.

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(2)
(Total 12 marks)

Q4. The table below shows information about some elements.

Element	Melting point in °C	Boiling point in °C
Fluorine	–202	–188
Chlorine	–101	–35

Bromine	–7	59
Iodine	114	184
Astatine		

(a) Look at the table above.

Describe the trend in melting point from fluorine to astatine.

.....

.....

(1)

(b) Estimate the boiling point of astatine.

Use the table above to help you.

Boiling point of astatine = ... °C

(1)

(c) Room temperature is 20 °C.

Which element in the table above is a liquid at room temperature?

.....

(1)

(d) To which group of the periodic table do the elements in the table above belong?

Tick **one** box.

Group 0 ☐

Group 1 ☐

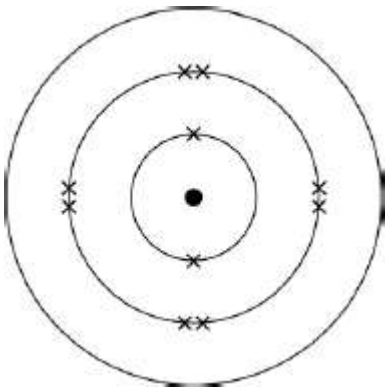
Group 5 ☐

Group 7 ☐

(1)

(e) A chlorine atom has 17 electrons.

On the figure below, use crosses to show the arrangement of electrons in the outer shell of a chlorine atom.



(1)

(f) Chlorine reacts with sodium bromide solution to produce bromine and sodium chloride solution.

Complete the symbol equation for the reaction.

.....Cl_2 + ... NaBr ⟶ ..... + ...

(2)

(g) Which element in the table above will react with sodium chloride solution?

Give a reason for your answer.

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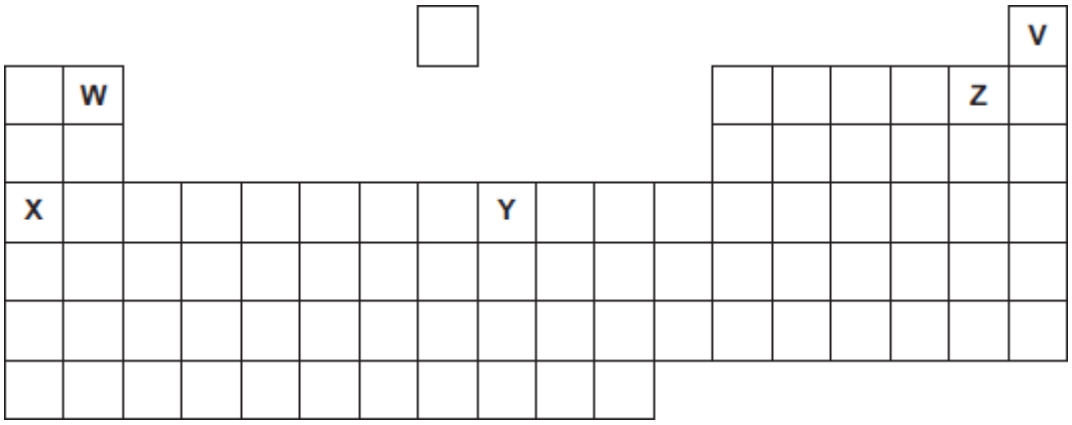
(2)
(Total 9 marks)

Q5. Five elements, **V**, **W**, **X**, **Y** and **Z**, are shown in the periodic table.

The letters are **not** the chemical symbols of the five elements.



Use the correct letter, **V**, **W**, **X**, **Y** or **Z**, to answer each question.

(a) Which element is a transition metal?

(1)

(b) Which element is in Group 2?

(1)

(c) Which element is a noble gas?

(1)

(d) Which element has an atomic (proton) number of 4?

☐

(1)

(e) Which element forms only 1+ ions?

☐

(1)
(Total 5 marks)

Q6. This question is about metals.

(a) Which unreactive metal is found in the Earth as the metal itself?

Tick (✓) **one** box.

aluminium ☐

gold ☐

magnesium ☐

(1)

(b) Complete the sentence.

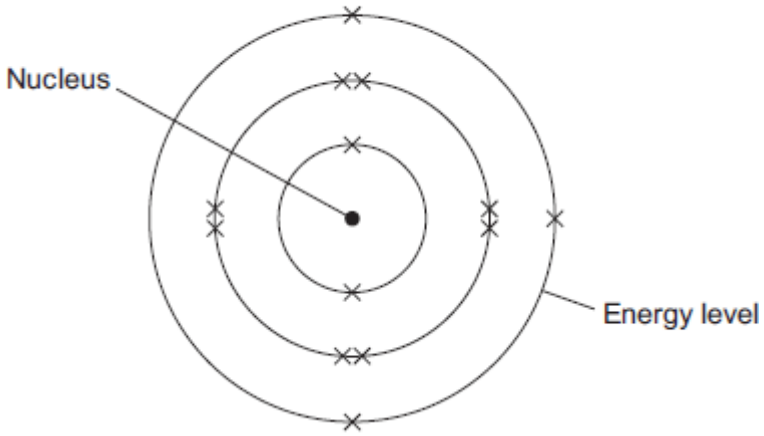
Aluminium is an element because aluminium is made of

only one type of ..... .

(1)

(c) **Figure 1** shows the electronic structure of an aluminium atom.

Figure 1



(i) Use the correct words from the box to complete the sentence.

electrons	**ions**	**protons**	**neutrons**	**shells**

The nucleus of an aluminium atom contains ..... and ..... .

(2)

(ii) Complete the sentence.

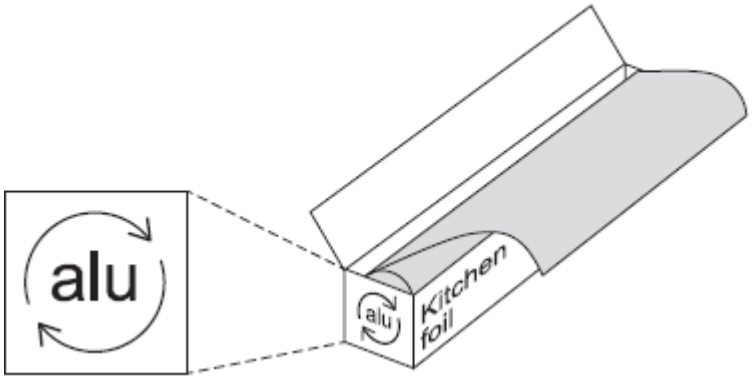
In the periodic table, aluminium is in Group ..... .

(1)

(d) Aluminium is used for kitchen foil.

Figure 2 shows a symbol on a box of kitchen foil.

Figure 2



The symbol means that aluminium can be recycled. It does not show the correct chemical symbol for aluminium.

(i) What is the correct chemical symbol for aluminium?
..... .

(1)

(ii) Give **two** reasons why aluminium should be recycled.

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(2)

(e) Aluminium has a low density, conducts electricity and is resistant to corrosion.

Which **one** of these properties makes aluminium suitable to use as kitchen foil? Give a reason for your answer.

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(2)
(Total 10 marks)