

Simple Model; Symbols; RAM; Charge; Isot

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	Simple Model; Symbols; RAM; Charge; Isot
Difficulty Level	Bronze Level
Booklet	Question Paper 1

Time Allowed: 60 minutes

Score: /56

Percentage: /100

Grade Boundaries:

Q1. The pH scale is a measure of the acidity or alkalinity of a solution.

- (a) Draw one line from each solution to the pH value of the solution.

Solution	pH value of the solution
	5
Acid	7
	9
Neutral	11
	13

(2)

- (b) Which ion in aqueous solution causes acidity?

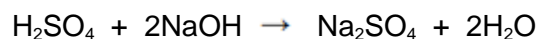
Tick **one** box.

H^+	<input type="checkbox"/>
Na^+	<input type="checkbox"/>
O^{2-}	<input type="checkbox"/>
OH^-	<input type="checkbox"/>

(1)

- (c) When sulfuric acid is added to sodium hydroxide a reaction occurs to produce two products.

The equation is:



How many elements are in the formula H_2SO_4 ?

Tick **one** box.

3

☐

4

☐

6

☐

7

☐

(1)

- (d) What is this type of reaction?

Tick **one** box.

Decomposition

☐

Displacement

☐

Neutralisation

☐

Reduction

☐

(1)

- (e) Name the salt produced.

.....

(1)

- (f) Describe how an indicator can be used to show when all the sodium hydroxide has reacted with sulfuric acid.

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(3)

(Total 9 marks)

Q2. 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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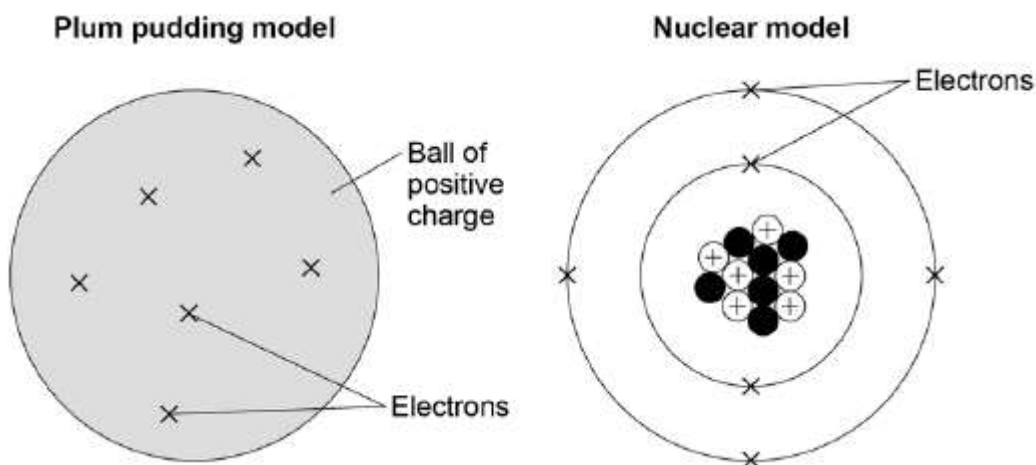
(2)

(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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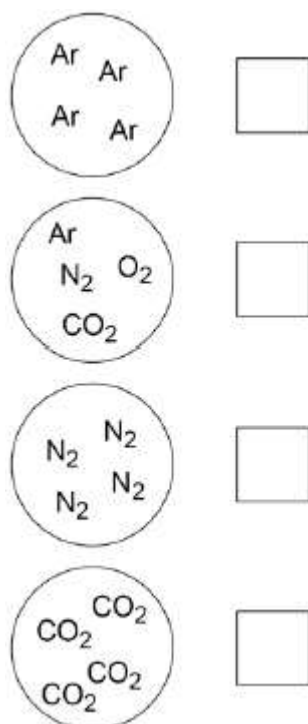
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(4)

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

Which circle shows a model of a mixture?

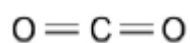
Tick **one** box.



(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

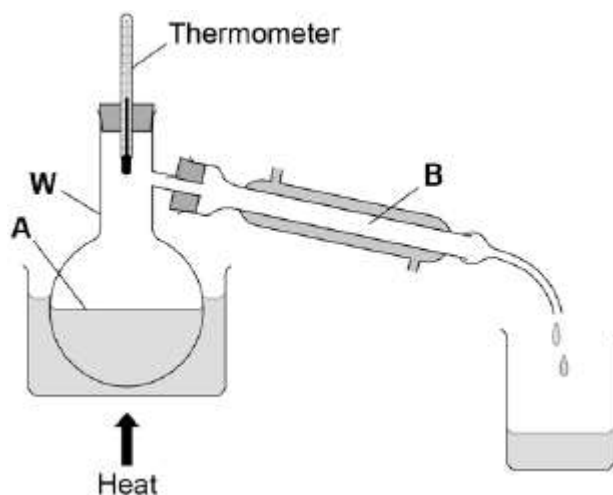
☐

Metallic bond

☐

(1)
(Total 10 marks)

Q3. The apparatus in the figure below is used to separate a mixture of liquids in a fuel.



(a) What is apparatus **W** on above the figure above?

Tick **one** box.

Beaker

☐

Boiling Tube

☐

Flask

☐

Jug

☐

(1)

(b) What is the name of this method of separation?

Tick **one** box.

Crystallisation

☐

Electrolysis

☐

Filtration

☐

Distillation

☐

(1)

- (c) Name the changes of state taking place at **A** and **B** in the figure above.

Use words from the box.

boiling	condensing	freezing	melting
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Change of state at **A**:

Change of state at **B**:

(2)

- (d) **Table 1** shows the boiling points of the hydrocarbons in the fuel.

Table 1

Hydrocarbon	Boiling point in °C
Pentane	36
Hexane	69
Heptane	98
Octane	125

Which hydrocarbon will be the last to collect in the beaker?

Tick **one** box.

Pentane

☐

Hexane

☐

Heptane

☐

Octane

☐

(1)

- (e) The fuel is a mixture of liquids that has been designed as a useful product.

What name is given to this type of mixture?

Tick **one** box.

Catalyst

☐

Formulation

☐

Polymer

☐

Solvent

☐

(1)

- (f) Describe how this fuel is different from crude oil.

.....

.....

.....

.....

(2)

- (g) A student measured the melting point of a solid hydrocarbon four times.

The student's results are in **Table 2**.

Table 2

	Trial 1	Trial 2	Trial 3	Trial 4
Melting point in °C	35	48	37	37

Calculate the mean melting point of the hydrocarbon, leaving out any anomalous result.

Give your answer to two significant figures.

.....

Mean melting point = °C

(2)
 (Total 10 marks)

Q4. 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

☐

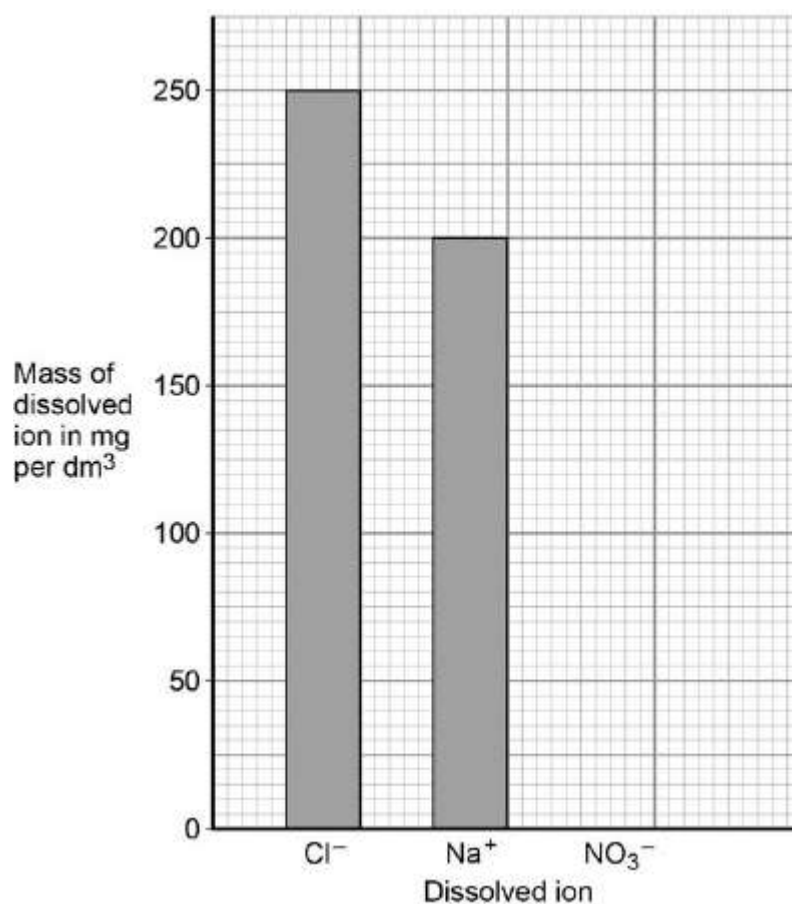
Chlorine ion

☐

(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.

$$\frac{1.5 \times 100}{4.0}$$

☐

$$\frac{1.5 \times 4.0}{100}$$

☐

$$\frac{4.0 \times 100}{1.5}$$

☐

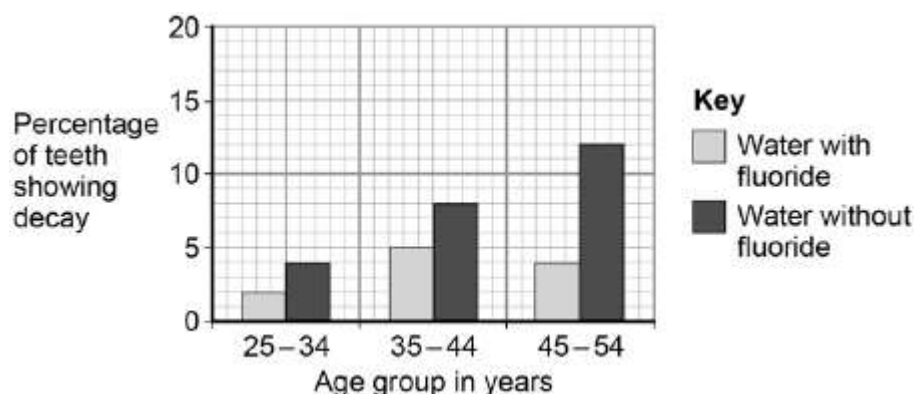
$$\frac{100}{1.5 \times 4.0}$$

☐

(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.

.....

.....

.....

.....

(2)

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

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.....

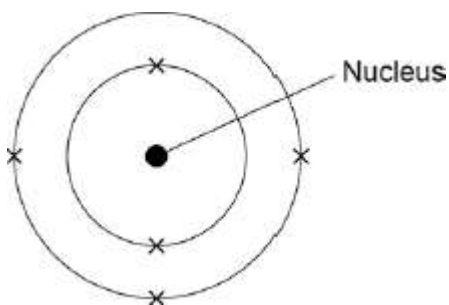
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(2)

(Total 12 marks)

Q5.The figure below shows an atom of boron.



- (a) When the mass of the boron atom is calculated, the mass of the electrons is ignored.

Why is the mass of the electrons ignored?

.....
.....

(1)

- (b) How many electrons are there in the boron atom?

.....

(1)

- (c) What is the electrical charge on the nucleus of the boron atom?

Tick **one** box.

+1

☐

+5

☐

+6

☐

+11

☐

(1)

- (d) The mass number of boron is 11.

Use the figure above to calculate the number of neutrons in the nucleus of the boron atom.

Explain how you worked out the answer.

Number of neutrons =

Explanation

.....

.....

(3)

- (e) Phosphorus has a mass number of 31 and has 16 neutrons.

What percentage of the mass number of phosphorus is the number of neutrons?

Give your answer to two significant figures.

.....

.....

Percentage =

(2)

(Total 8 marks)

Q6. The elements in the periodic table are arranged in groups.

- (a) What is similar about the elements in the same group?

Tick **one** box.

Chemical properties

☐

Atomic numbers

☐

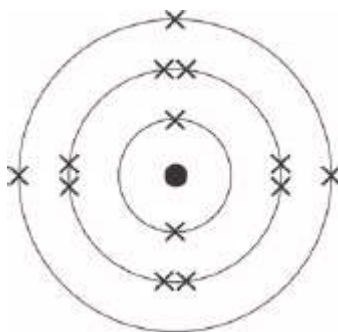
Relative atomic masses

☐

(1)

- (b) **Figure 1** shows the arrangement of electrons in an atom.

Figure 1



What group of the periodic table is this atom in?

Group

(1)

- (c) Why are the elements in Group 0 unreactive?

Tick **one** box.

They are all gases at room temperature

☐

They all have the same atomic number

☐

They are all in the same group of the periodic table

☐

They all have a stable arrangement of electrons

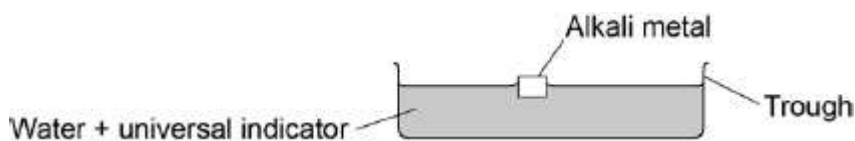
☐

(1)

- (d) A teacher demonstrates the reaction of some alkali metals with water.

Look at **Figure 2**.

Figure 2



The students write what they see.

1. The alkali metals float on water.
2. The alkali metals fizz when they react with water.
3. The universal indicator changes from green to purple.
4. The sodium disappears faster than the lithium.

Give a reason for each of the four things that the students see.

1. The alkali metals float on water.

Reason

.....

2. The alkali metals fizz when they react with water.

Reason

.....

3. The universal indicator changes from green to purple.

Reason

.....

4. The sodium disappears faster than the lithium.

Reason

.....

(4)
(Total 7 marks)