

Simple Model; Symbols; RAM; Charge; Isot

Question Paper 1

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|------------------|---------------------------------------------|
| 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 | Silver Level |
| Booklet | Question Paper |

Time Allowed: 60 minutes

Score: /59

Percentage: /100

Grade Boundaries:

Q1. This question is about calcium.

- (a) What type of compound is calcium oxide?

Tick **one** box.

An acid

☐

A base

☐

A carbonate

☐

A salt

☐

(1)

- (b) Ionic compounds, such as calcium oxide, have high melting points.

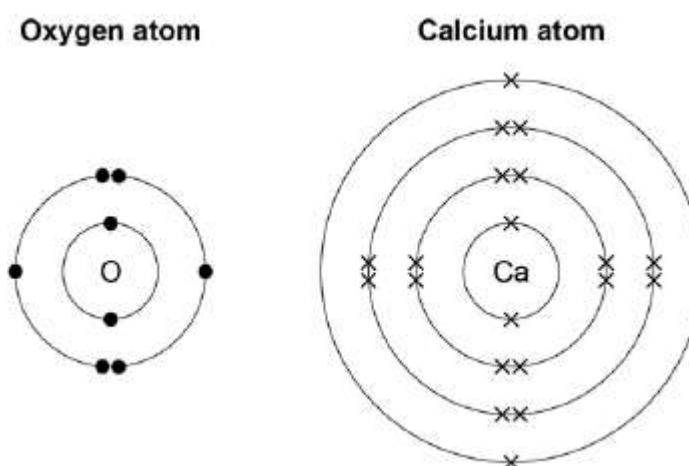
Complete the sentences. Use words from the box.

| | |
|--------------|---------------|
| bonds | forces |
| ions | layers |

Calcium oxide has a giant ionic lattice in which there are strong electrostatic of attraction in all directions.

(1)

- (c) The figure below shows the electronic structure of an oxygen atom and a calcium atom.



Describe how the calcium atom and the oxygen atom forms calcium oxide.

You should give the charge on each ion formed.

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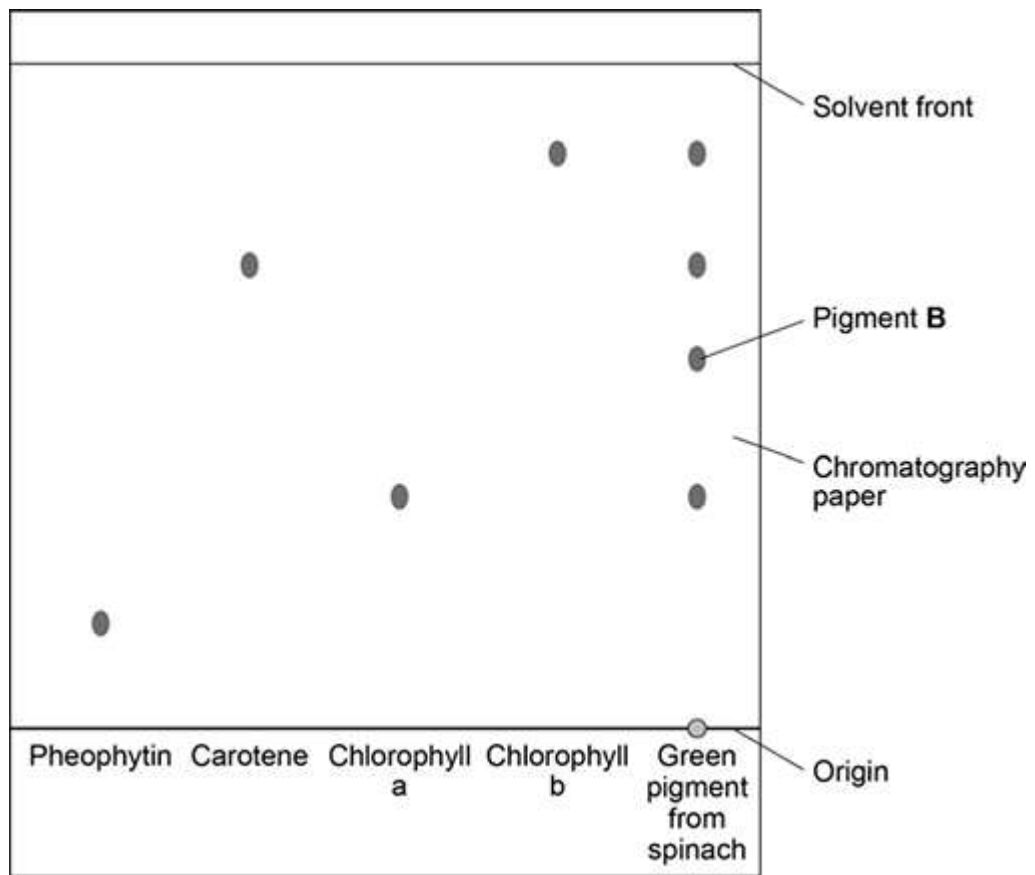
(4)
(Total 6 marks)

Q2.A student used paper chromatography to identify the pigments in spinach leaves.

She used propanone as a solvent.

Figure 1 shows the student's results.

Figure 1



- (a) Name the mobile phase and the stationary phase in the student's experiment.

Mobile phase

Stationary phase

(2)

- (b) What does **Figure 1** tell you about the green pigment from spinach?

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(3)

- (c) Write the equation that links distance moved by solvent, distance moved by solute and R_f value.

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(1)

- (d) Use **Figure 1** to calculate the R_f value for pigment **B**.

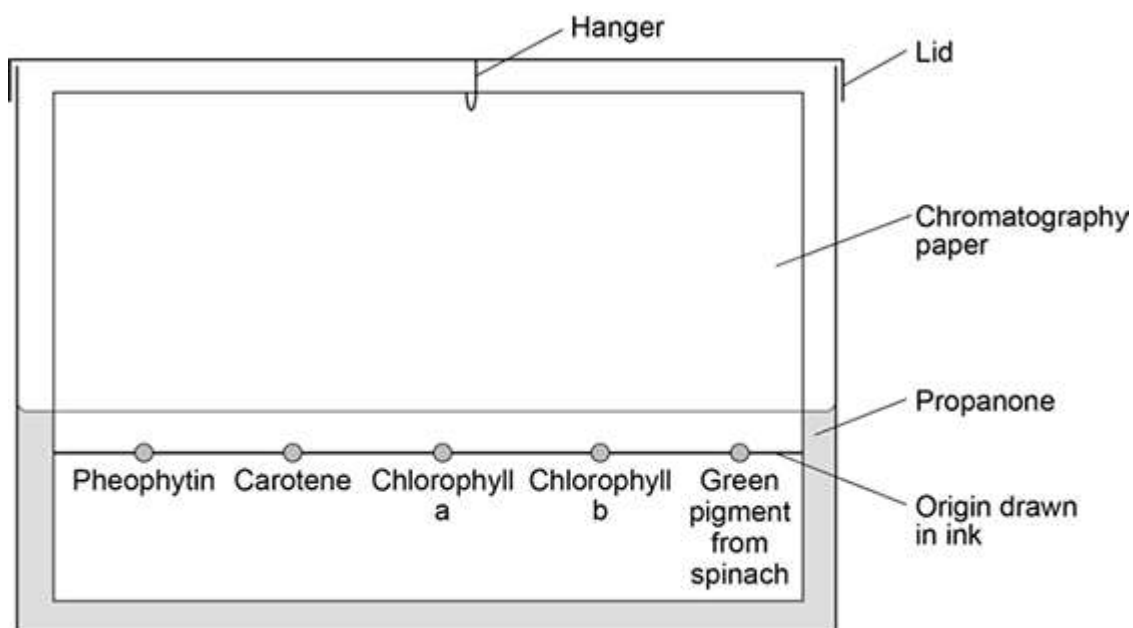
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R_f value =

(3)

- (e) Another student set up the apparatus shown in **Figure 2**.

Figure 2



This student did not set up the apparatus correctly.

Identify the errors the student made.

Explain how the errors she made would affect her results.

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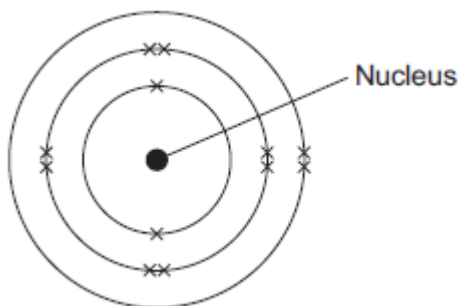
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(4)
(Total 13 marks)

Q3. This question is about magnesium.

- (a) (i) The electronic structure of a magnesium atom is shown below.



Use the correct answer from the box to complete each sentence.

| | | | |
|-----------|----------|---------|--------|
| electrons | neutrons | protons | shells |
|-----------|----------|---------|--------|

The nucleus contains protons and

The particles with the smallest relative mass that move around the nucleus are called

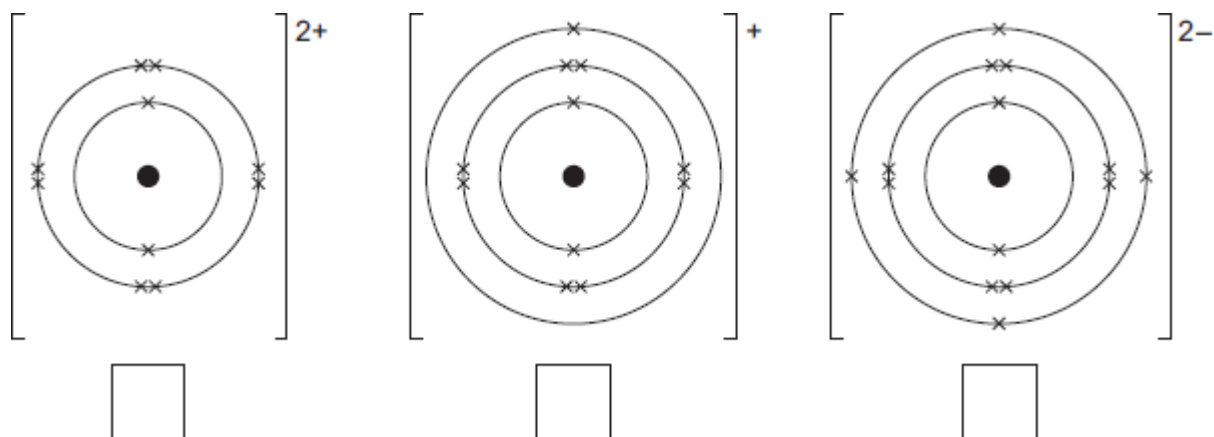
Atoms of magnesium are neutral because they contain the same number of electrons and

(3)

- (ii) A magnesium atom reacts to produce a magnesium ion.

Which diagram shows a magnesium ion?

Tick (✓) **one** box.



(1)

- (b) Magnesium and dilute hydrochloric acid react to produce magnesium chloride solution and hydrogen.



- (i) State **two** observations that could be made during the reaction.

1

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2

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(2)

- (ii) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Describe a method for making pure crystals of magnesium chloride from magnesium and dilute hydrochloric acid.

In your method you should name the apparatus you will use.

You do **not** need to mention safety.

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(6)
(Total 12 marks)

Q4. This question is about atomic structure and elements.

(a) Complete the sentences.

(i) The atomic number of an atom is the number of

(1)

(ii) The mass number of an atom is the number of

.....

(1)

(b) Explain why an atom has no overall charge.

Use the relative electrical charges of sub-atomic particles in your explanation.

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(2)

- (c) Explain why fluorine and chlorine are in the same group of the periodic table.

Give the electronic structures of fluorine and chlorine in your explanation.

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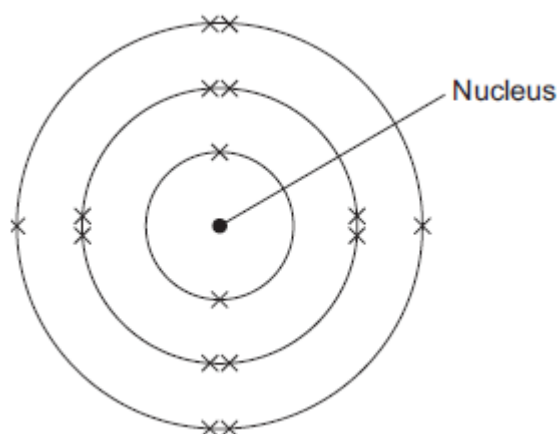
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(2)

- (d) The diagram shows the electronic structure of an atom of a non-metal.



What is the chemical symbol of this non-metal?

Tick (✓) **one** box.

Ar

☐

O

☐

S

☐

Si

☐

(1)

- (e) When elements react, their atoms join with other atoms to form compounds.

Complete the sentences.

- (i) Compounds formed when non-metals react with metals consist of particles called

(1)

- (ii) Compounds formed from only non-metals consist of particles called

(1)

(Total 9 marks)

Q5. This question is about atoms and isotopes.

- (a) Atoms contain protons, neutrons and electrons.

A lithium atom has the symbol ${}^7_3\text{Li}$

Explain, in terms of sub-atomic particles, why the mass number of this lithium atom is 7.

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(3)

- (b) Amounts of substances can be described in different ways.

Complete the sentences.

One mole of a substance is the relative formula mass in

.....

.....

(c) Two isotopes of oxygen are $^{18}_8\text{O}$ and $^{16}_8\text{O}$

Describe the similarities and differences between the isotopes $^{18}_8\text{O}$ and $^{16}_8\text{O}$

[illegible]

(Total 8 marks)

Figure 1

[illegible]

Choose the correct symbol from **Figure 1** to answer each question.

You may use each symbol once, more than once or not at all.

Write the symbol that represents:

- (i) a Group 1 element

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(1)

- (ii) a transition metal

.....

(1)

- (iii) an element with electrons in the same number of energy levels as an atom of argon (Ar)

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(1)

- (iv) an element which forms an oxide that dissolves in water to form an acidic solution

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(1)

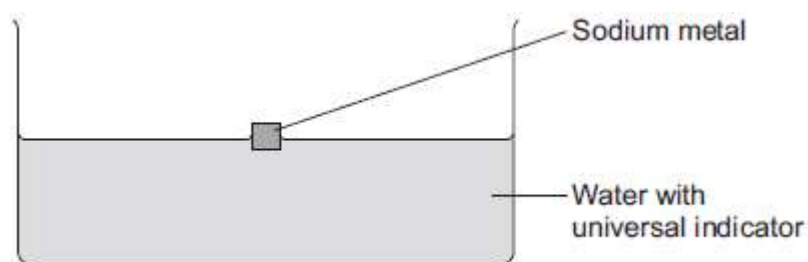
- (v) an element that forms a chloride with the formula XCl

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(1)

- (b) A teacher put a cube of sodium metal into water containing universal indicator, as shown in **Figure 2**.

Figure 2



The equation for the reaction is:



- (i) The sodium floated on the surface of the water. The universal indicator turned purple.

Give **three other** observations that would be seen during the reaction.

- 1
- 2
- 3

(3)

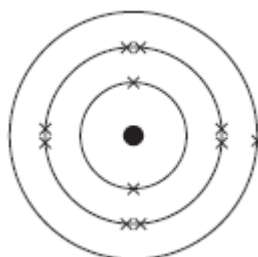
- (ii) Name the ion that made the universal indicator turn purple.

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(1)

- (c) **Figure 3** represents the electronic structure of a sodium atom.

Figure 3



In the space below, draw the electronic structure of a sodium ion. Include the charge on the ion.

(2)
(Total 11 marks)