

## Atomic Structure Homework task 1

### Q1.

Magnesium is in Group 2 of the periodic table.

1.0 g of magnesium reacted with chlorine to produce magnesium chloride.

(a) Which types of element react when magnesium reacted with chlorine?

Tick (✓) **one** box.

A metal and a metal

A metal and a non-metal

A non-metal and a non-metal

(1)

(b) Write the word equation for the reaction when magnesium reacts with chlorine.

\_\_\_\_\_ + \_\_\_\_\_ → \_\_\_\_\_

(1)

(c) What apparatus was used to measure the mass of 1.0 g of magnesium?

Tick (✓) **one** box.

Balance

Beaker

Ruler

(1)

(d) What mass of magnesium chloride was produced?

Tick (✓) **one** box.

Less than 1.0 g

1.0 g

More than 1.0 g

- (e) Magnesium reacts with oxygen to produce magnesium oxide.

Calculate the percentage mass of magnesium in magnesium oxide (MgO).

Relative atomic mass ( $A_r$ ): Mg = 24

Relative formula mass ( $M_r$ ): MgO = 40

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Percentage mass of magnesium = \_\_\_\_\_ %

(2)

Magnesium carbonate decomposes to produce magnesium oxide and carbon dioxide.

The word equation for the reaction is:

magnesium carbonate → magnesium oxide + carbon dioxide

Four students heated 2.00 g of magnesium carbonate for 10 minutes.

The table below shows the results.

Mass of carbon dioxide produced in g				
Student 1	Student 2	Student 3	Student 4	Mean
0.97	0.91	0.50	0.95	X

- (f) What is the most likely reason for **Student 3's** anomalous result?

Tick (✓) **one** box.

The student heated more than 2.00 g of magnesium carbonate.

The student heated the magnesium carbonate for less than 10 minutes.

The student used a higher temperature.

(1)

(g) Calculate value **X** in the table above.

Do **not** use the anomalous result.

Give your answer to 2 significant figures.

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**X** (2 significant figures) = \_\_\_\_\_ g

(3)

(Total 10 marks)

**Q2.**

This question is about the periodic table.

(a) **Figure 1** shows part of Mendeleev's version of the periodic table.

**Figure 1**

H							
Li	Be	B	C	N	O	F	
Na	Mg	Al	Si	P	S	Cl	
K	Ca		Ti	V	Cr	Mn	
Cu	Zn			As	Se	Br	Fe Co Ni
Rb	Sr	Y	Zr	Nb	Mo		
Ag	Cd	In	Sn	Sb	Te	I	Ru Rh Pd

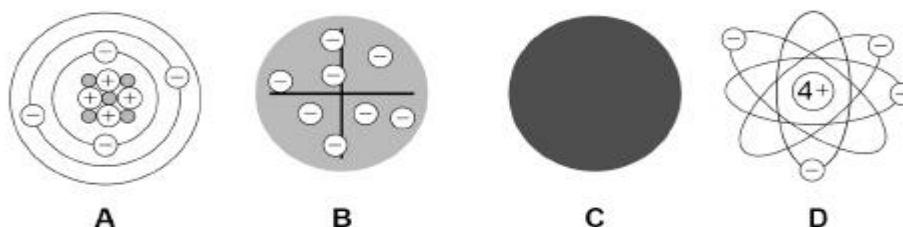
Which group of elements had **not** been discovered when Mendeleev's version of the periodic table was published?

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(1)

**Figure 2** represents different models of the atom.

**Figure 2**



(b) Which model represents the plum pudding model?

Tick (✓) **one** box.

A       B       C       D

(1)

(c) Which model resulted from Chadwick's experimental work?

Tick (✓) **one** box.

A       B       C       D

(1)

Potassium has different isotopes.

(d) What is meant by 'isotopes'?

You should refer to subatomic particles.

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(2)

(e) The table below shows the mass numbers and the percentage abundance of two isotopes of potassium.

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.

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Relative atomic mass (1 decimal place) = \_\_\_\_\_

(3)

(Total 8 marks)

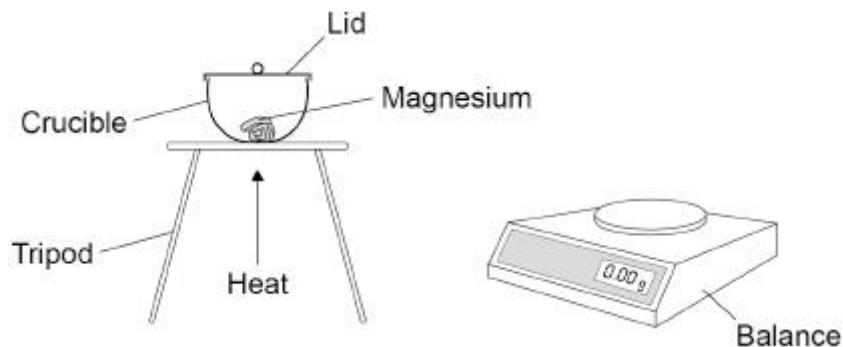
## HIGHER TIER QUESTIONS

### Q3.

Metal oxides are produced when metals are heated in air.

A student investigated the change in mass when 0.12 g of magnesium was heated in air.

The figure below shows the apparatus.



The student measured the mass of magnesium oxide produced.

- (a) 0.12 g of magnesium reacted to produce 0.20 g of magnesium oxide.

Calculate the number of moles of oxygen gas ( $O_2$ ) that reacted.

Relative atomic mass ( $A_r$ ): O = 16

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Moles of oxygen gas = \_\_\_\_\_

(3)

- (b) The student repeated the experiment **without** a lid on the crucible.

Suggest why the mass of magnesium oxide produced would be different without a lid on the crucible.

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(2)

(c) Copper reacts with oxygen to produce copper oxide.

63.5 g of copper produces 79.5 g of copper oxide.

Calculate the mass of copper oxide produced when 0.50 g of copper reacts with oxygen.

Give your answer to 3 significant figures.

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Mass (3 significant figures) = \_\_\_\_\_ g

(3)

(d) Iron reacts with oxygen to produce an oxide of iron.

0.015 moles of iron reacts with 0.010 moles of oxygen gas (O<sub>2</sub>).

Determine:

- the formula of the iron oxide produced
- the balanced symbol equation for the reaction.

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Formula of iron oxide = \_\_\_\_\_

Balanced symbol equation

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(4)

(Total 12 marks)

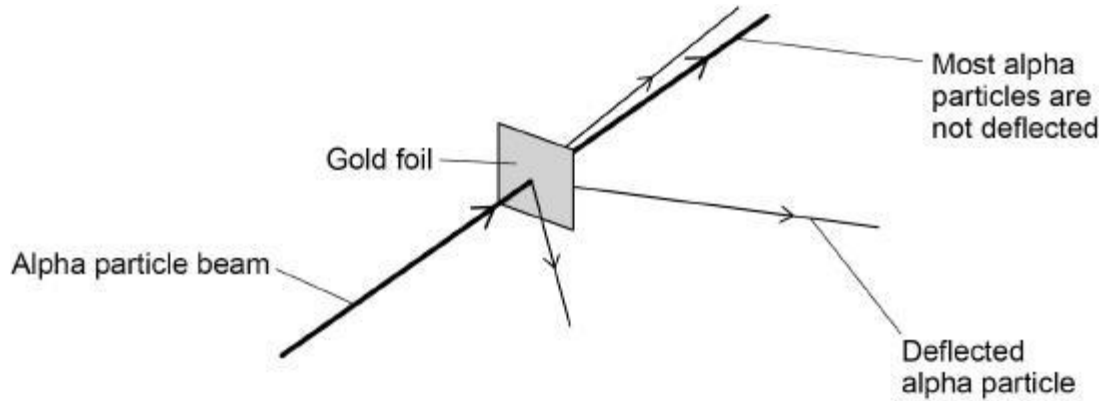
**Q4.**

This question is about gold and compounds of gold.

(a) In the alpha particle scattering experiment alpha particles are fired at gold foil.

Alpha particles are positively charged.

The diagram below shows the results.



What **two** conclusions can be made from the results?

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.

(2)

(b) 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.

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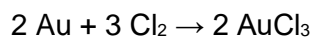
Diameter of one gold atom (3 significant figures) = \_\_\_\_\_ m

(3)

(c) 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:



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

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Mass of chlorine = \_\_\_\_\_ mg

(5)

(Total 10 marks)