



# **GCSE Chemistry**

## **Atomic Structure**

### **Question Paper**

**Time available: 55 minutes**

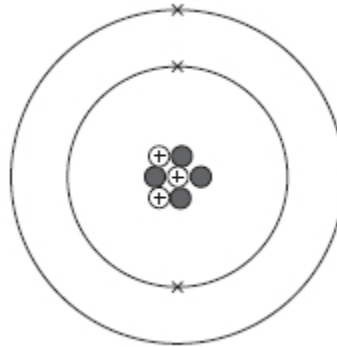
**Marks available: 51 marks**

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1.

This question is about atomic structure.

The figure below represents the structure of a lithium atom.



- (a) Name the particle in the atom that has a positive charge.

\_\_\_\_\_

(1)

- (b) Name the particle in the atom that has the smallest mass.

\_\_\_\_\_

(1)

- (c) Complete the sentences.

Choose the answers from the box.

3	4	7	10
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The mass number of the lithium atom is \_\_\_\_\_.

The number of neutrons in the lithium atom is \_\_\_\_\_.

(2)

(d) What are lithium atoms with different numbers of neutrons called?

Tick (✓) **one** box.

Compounds

Ions

Isotopes

Molecules

(1)

(e) Name the particle in the atom discovered by James Chadwick.

\_\_\_\_\_ .

(1)

(f) An element has two isotopes.

The table shows information about the isotopes.

	Mass number	Percentage (%) abundance
Isotope 1	10	20
Isotope 2	11	80

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

Use the equation:

$$A_r = \frac{(\text{mass number} \times \text{percentage}) \text{ of isotope 1} + (\text{mass number} \times \text{percentage}) \text{ of isotope 2}}{100}$$

Give your answer to 1 decimal place.

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Relative atomic mass ( $A_r$ ) = \_\_\_\_\_

(2)

(g) The radius of an atom is 0.2 nm

The radius of the nucleus is  $\frac{1}{10000}$  the radius of the atom.

Calculate the radius of the nucleus.

Give your answer in standard form.

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Radius = \_\_\_\_\_ nm

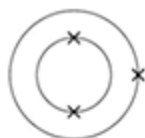
(2)

(Total 10 marks)

2.

The electronic structure of the atoms of five elements are shown in the figure below.

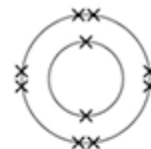
The letters are **not** the symbols of the elements.



Element A



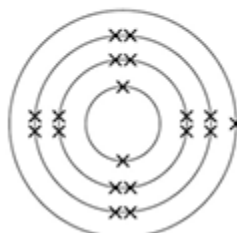
Element B



Element C



Element D



Element E

Choose the element to answer the question. Each element can be used once, more than once or not at all.

Use the periodic table to help you.

(a) Which element is hydrogen?

Tick **one** box.

A  B  C  D  E

(1)

(b) Which element is a halogen?

Tick **one** box.

A  B  C  D  E

(1)

(c) Which element is a metal in the same group of the periodic table as element A?

Tick **one** box.

A  B  C  D  E

(1)

(d) Which element exists as single atoms?

Tick **one** box.

A       B       C       D       E

(1)

(e) There are two isotopes of element **A**. Information about the two isotopes is shown in the table below.

Mass number of the isotope	6	7
Percentage abundance	92.5	7.5

Use the information in the table above to calculate the relative atomic mass of element **A**.

Give your answer to 2 decimal places.

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Relative atomic mass = \_\_\_\_\_

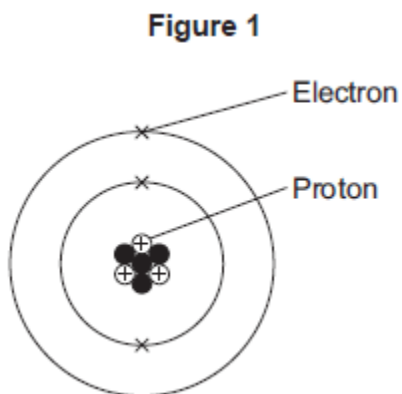
(4)

(Total 8 marks)

3.

There are eight elements in the second row (lithium to neon) of the periodic table.

(a) **Figure 1** shows a lithium atom.



(i) What is the mass number of the lithium atom in **Figure 1**?

Tick (✓) **one** box.

3	<input type="checkbox"/>
4	<input type="checkbox"/>
7	<input type="checkbox"/>

(1)

(ii) What is the charge of an electron?

Tick (✓) **one** box.

-1	<input type="checkbox"/>
0	<input type="checkbox"/>
+1	<input type="checkbox"/>

(1)

(iii) Protons are in the nucleus.

Which other sub-atomic particles are in the nucleus?

Tick (✓) **one** box.

ions

molecules

neutrons

(1)

(b) What is **always** different for atoms of different elements?

Tick (✓) **one** box.

number of neutrons

number of protons

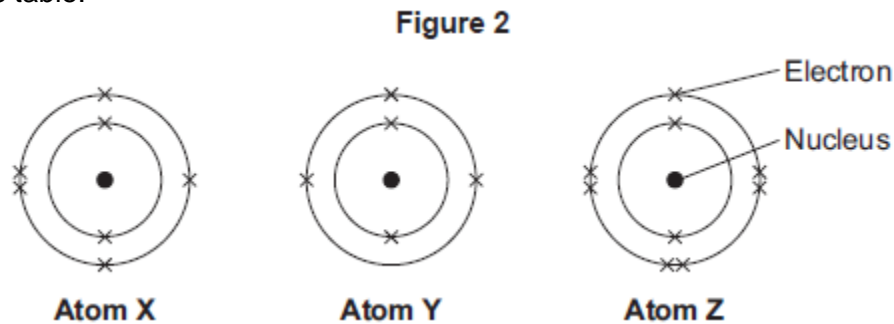
number of shells

(1)



- (c) **Figure 2** shows the electron arrangements of three different atoms, **X**, **Y** and **Z**.

These atoms are from elements in the second row (lithium to neon) of the periodic table.



Which atom is from an element in Group 3 of the periodic table?

Tick (✓) **one** box.

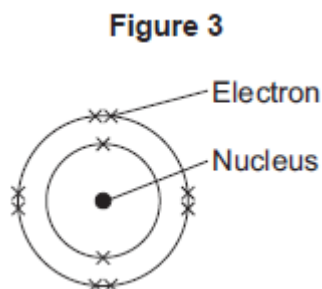
**Atom X**

**Atom Y**

**Atom Z**

(1)

- (d) **Figure 3** shows the electron arrangement of a different atom from an element in the second row of the periodic table.



- (i) Give the chemical symbol of this element.

\_\_\_\_\_

(1)

- (ii) Why is this element unreactive?

\_\_\_\_\_

\_\_\_\_\_

(1)

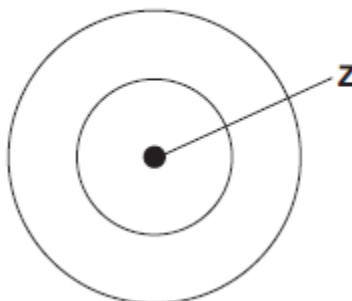
**(Total 7 marks)**

4.

There are eight elements in the second row (lithium to neon) of the periodic table.

(a) **Figure 1** shows an atom with two energy levels (shells).

**Figure 1**



(i) Complete **Figure 1** to show the electronic structure of a boron atom.

(1)

(ii) What does the central part labelled **Z** represent in **Figure 1**?

\_\_\_\_\_

(1)

(iii) Name the sub-atomic particles in part **Z** of a boron atom.

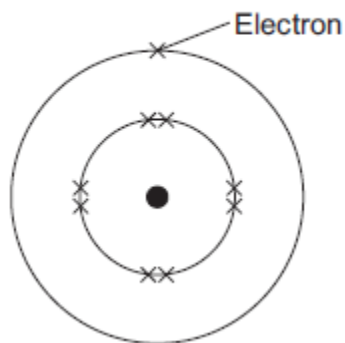
Give the relative charges of these sub-atomic particles.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(3)

(b) The electronic structure of a neon atom shown in **Figure 2** is **not** correct.

**Figure 2**



Explain what is wrong with the electronic structure shown in **Figure 2**.

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(3)

(Total 8 marks)

**5.**

This question is about metals.

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

Tick (✓) **one** box.

aluminium

gold

magnesium

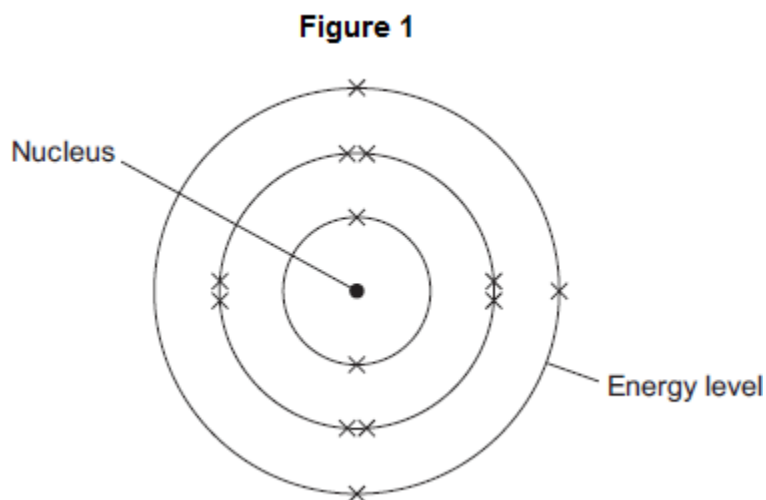
(1)

(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.



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

<b>electrons</b>	<b>ions</b>	<b>protons</b>	<b>neutrons</b>	<b>shells</b>
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The nucleus of an aluminium atom contains \_\_\_\_\_ and  
\_\_\_\_\_ .

(2)

(ii) Complete the sentence.

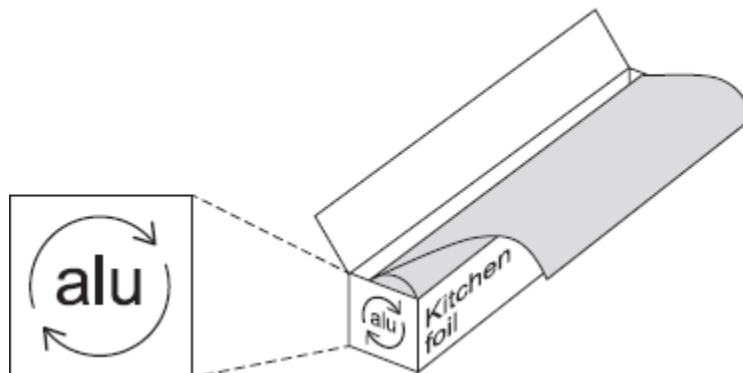
In the periodic table, aluminium is in Group \_\_\_\_\_ .

(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.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(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.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(2)

(Total 10 marks)

6. 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

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The relative atomic mass of an element compares the mass of an atom of an element with the mass of an atom of

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(2)

(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  ${}^{16}_8\text{O}$

You should refer to the numbers of sub-atomic particles in each isotope.

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(3)

(Total 8 marks)