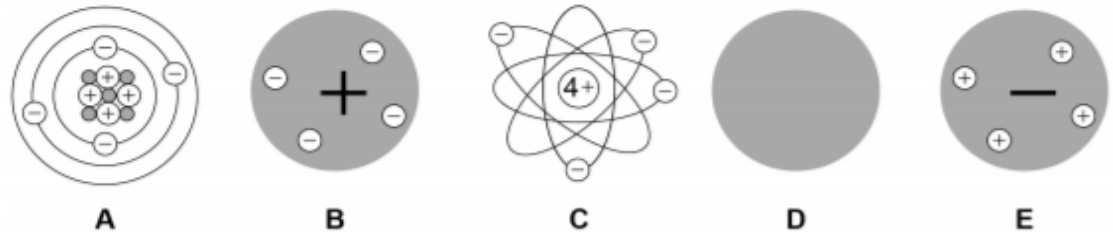
Atoms, Isotopes and Atomic Models Past Paper Questions GCSE AQA

1.

Figure 3 represents different models of the atom.

Figure 3



1 Which diagram shows the plum pudding model of the atom?

[1 mark]

Tick **one** box.

A		B		C		D		E	

2 Which diagram shows the model of the atom developed from the alpha particle scattering experiment?

[1 mark]

Tick **one** box.

A		B		C		D		E	

3 Which diagram shows the model of the atom resulting from Bohr's work?

[1 mark]

Tick **one** box.

A		B		C		D		E	

. 4 Define the mass number of an atom.

[1 mark]

. 5 Element **X** has two isotopes. Their mass numbers are 69 and 71

The percentage abundance of each isotope is:

- 60% of $^{69}\mathbf{X}$
- 40% of $^{71}\mathbf{X}$

Estimate the relative atomic mass of element **X**.

[1 mark]

Tick **one** box.

< 69.5	☐
Between 69.5 and 70.0	☐
Between 70.0 and 70.5	☐
> 70.5	☐

. 6 Chadwick's experimental work on the atom led to a better understanding of isotopes.

Explain how his work led to this understanding.

[3 marks]

2.

An atom of aluminium has the symbol $^{27}_{13}Al$

. 1 Give the number of protons, neutrons and electrons in this atom of aluminium.

[3 marks]

Number of protons _____

Number of neutrons _____

Number of electrons _____

. 2 Why is aluminium positioned in Group 3 of the periodic table?

[1 mark]

_____

_____

3.

Elements are made of atoms.

(a) **Table 1** shows the atomic numbers and mass numbers of three atoms.

Table 1

Atom	Atomic number	Mass number
1	12	24
2	12	25
3	12	26

(a) (i) Suggest, in terms of the number of subatomic particles, why the atomic numbers of the three atoms are the same.

[1 mark]

_____

_____

(a) (ii) Explain, in terms of the number of subatomic particles, why the mass numbers of the three atoms are different.

[2 marks]

_____

_____

_____

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

Sulfuric acid, H_2SO_4, is a compound.

(b) (i) How many elements are in the formula H_2SO_4?

[1 mark]

_____

(b) (ii) How many atoms are in the formula H_2SO_4?

[1 mark]

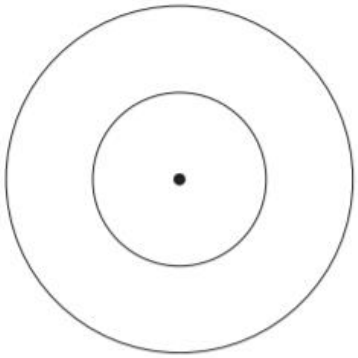
_____

4.

This question is about compounds of carbon.

(a) **Figure 2** shows an atom with two energy levels (shells).

Figure 2



(a) (i) A carbon atom has six electrons.

Complete **Figure 2** to show the electronic structure of a carbon atom.

Use **x** to represent an electron.

[1 mark]

(a) (ii) Complete the following description about the central part of this carbon atom.

[3 marks]

The central part is made up of six neutrons that have no electrical charge and _____

_____

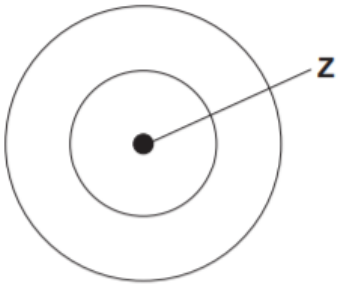
_____

5.

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



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

[1 mark]

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

[1 mark]

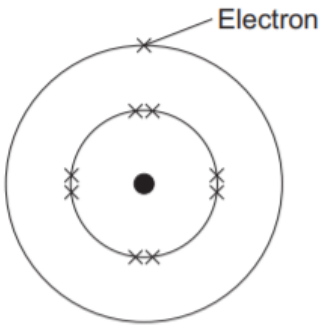
(a) (iii) Name the sub-atomic particles in part **Z** of a boron atom.

Give the relative charges of these sub-atomic particles.

[3 marks]

(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**.

[3 marks]

6.

This question is about atoms, molecules and nanoparticles.

(a) Different atoms have different numbers of sub-atomic particles.

(a) (i) An oxygen atom can be represented as $^{16}_{8}O$

Explain why the mass number of this atom is 16.

You should refer to the numbers of sub-atomic particles in the nucleus of the atom.

[2 marks]

(a) (ii) Explain why $^{12}_{6}C$ and $^{14}_{6}C$ are isotopes of carbon.

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

[3 marks]

7.

This question is about atomic structure and elements.

(a) Complete the sentences.

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

[1 mark]

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

..... .

[1 mark]

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

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

[2 marks]

.....

.....

.....

.....

(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.

[2 marks]

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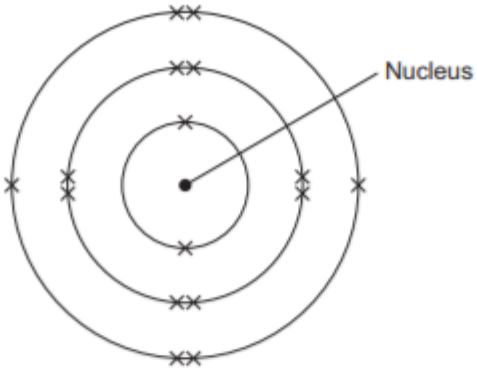
(d) **Figure 1** shows the electronic structure of an atom of a non-metal.

Figure 1



What is the chemical symbol of this non-metal?

[1 mark]

Tick (✓) **one** box.

Ar ☐

O ☐

S ☐

Si ☐

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

Complete the sentences.

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

particles called ..... .

[1 mark]

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

particles called ..... .

[1 mark]

8.

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.

[3 marks]

.....

.....

.....

.....

.....

.....

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

Complete the sentences.

[2 marks]

One mole of a substance is the relative formula mass in ..... .

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

(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.

[3 marks]