

Name:

Date:

C1 - Test 1  
ATOMIC STRUCTURE  
Beginner

**GCSE**

**CHEMISTRY**

**AQA - Triple Science**

Mark

Grade

---

### Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

### Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

### Information

- The marks for the questions are shown in brackets

1.

This question is about atoms.

Atoms contain electrons, neutrons and protons.

(a) (i) Which of these particles has a positive charge?

Tick (✓) **one** box.

Electron

Neutron

Proton

(1)

(ii) Which of these particles does **not** have an electrical charge?

Tick (✓) **one** box.

Electron

Neutron

Proton

(1)

(b) How are the elements in the periodic table arranged?

Tick (✓) **one** box.

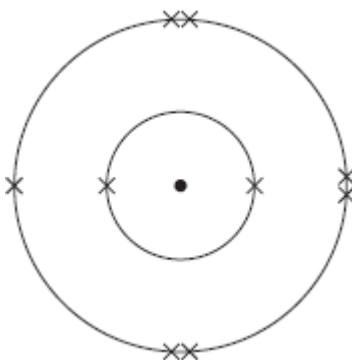
In order of increasing atomic number

In order of increasing mass number

In order of increasing reactivity

(1)

(c) The diagram shows the arrangement of the electrons in an atom of fluorine.



(i) How many protons are in an atom of fluorine?

Tick (✓) **one** box.

2

7

9

(1)

(ii) The boiling point of fluorine is  $-188\text{ }^{\circ}\text{C}$ .

What is the state of fluorine at room temperature?

Tick (✓) **one** box.

Solid

Liquid

Gas

**(1)**

(d) Fluorine reacts with copper to form an ionic compound.

(i) Explain, in terms of electrons and electronic structure, what happens to a fluorine atom when it reacts with copper.

Use the figure above to help you to answer this question.

---

---

---

---

---

**(2)**

(ii) Describe a chemical test which would show that a solution contains copper(II) ions.

---

---

---

---

---

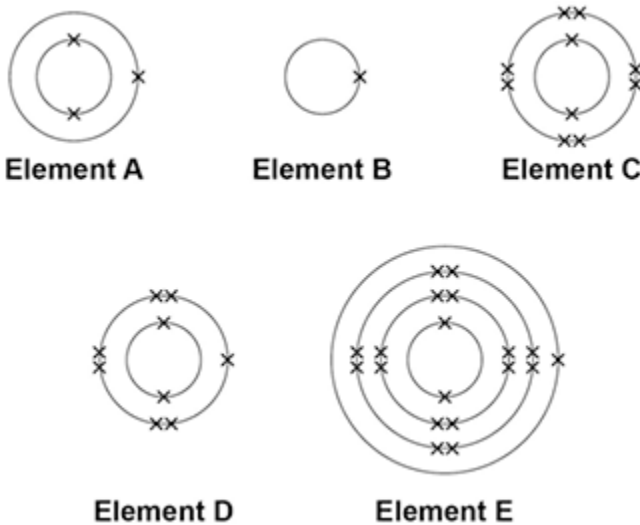
**(2)**

**(Total 9 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.



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.

---

---

---

---

---

---

---

---

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

(4)

(Total 8 marks)



- (b) A chemistry teacher demonstrated the reaction between sodium and water to a class of students. One of the students wrote the following notes:

**The reaction between sodium and water**

A piece of sodium was cut easily into smaller pieces with a knife.

The sodium was added to some water in a trough.

The sodium:

- floated
- melted quickly to give a silvery ball
- moved on the surface of the water
- fizzed.

Use the information in the box to help you answer these questions.

What evidence is there that:

- (i) sodium has a low melting point

---

---

(1)

- (ii) sodium is soft

---

---

(1)

- (iii) a gas was produced?

---

---

(1)

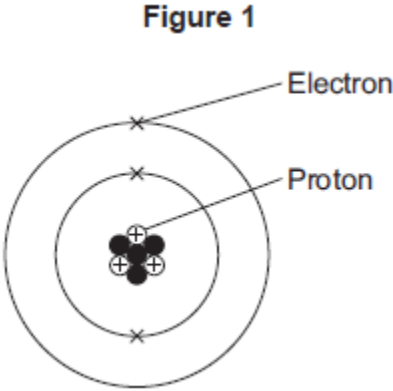
**(Total 6 marks)**



4.

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.

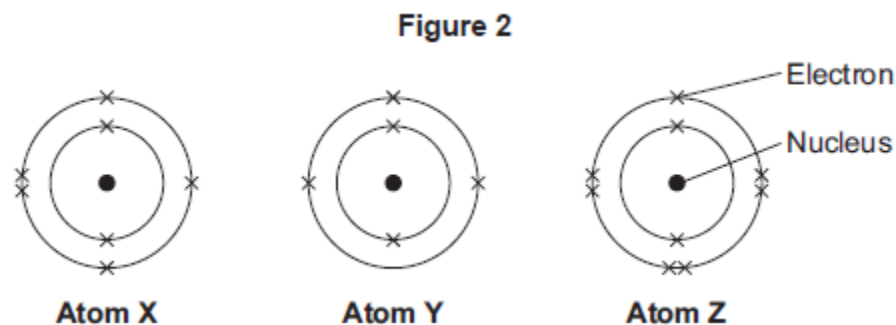
number of neutrons

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.

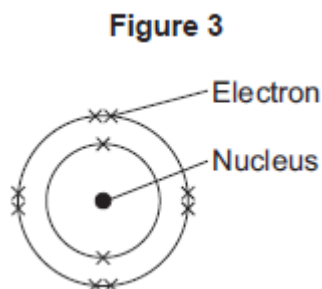
**Atom X**

**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)**



6. This question is about carbon and gases in the air.

(a) Carbon atoms have protons, neutrons and electrons.

Complete the table by writing the relative mass of a neutron and an electron.

| Name of particle | Relative mass |
|------------------|---------------|
| proton           | 1             |
| neutron          |               |
| electron         |               |

(2)

(b) What is the total number of protons and neutrons in an atom called?

Tick (✓) **one** box.

The atomic number

The mass number

One mole of the atom

(1)

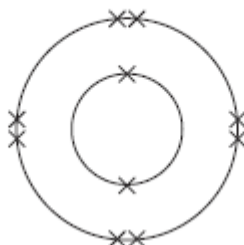
(c) An atom of carbon has six electrons.

Which structure, **A**, **B** or **C**, represents the electronic structure of the carbon atom?

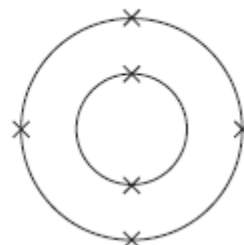
**Structure A**



**Structure B**



**Structure C**



The carbon atom is structure

(1)

(d) Carbon reacts with oxygen to produce carbon dioxide (CO<sub>2</sub>).

(i) How many different elements are in one molecule of carbon dioxide?

\_\_\_\_\_

(1)

(ii) What is the total number of atoms in one molecule of carbon dioxide?

\_\_\_\_\_

(1)

(e) Sometimes carbon reacts with oxygen to produce carbon monoxide (CO).

(i) Calculate the relative formula mass ( $M_r$ ) of carbon monoxide.

Relative atomic masses ( $A_r$ ): C = 12; O = 16

\_\_\_\_\_

\_\_\_\_\_

$M_r$  of carbon monoxide = \_\_\_\_\_

(1)

(ii) Calculate the percentage by mass of carbon in carbon monoxide.

\_\_\_\_\_

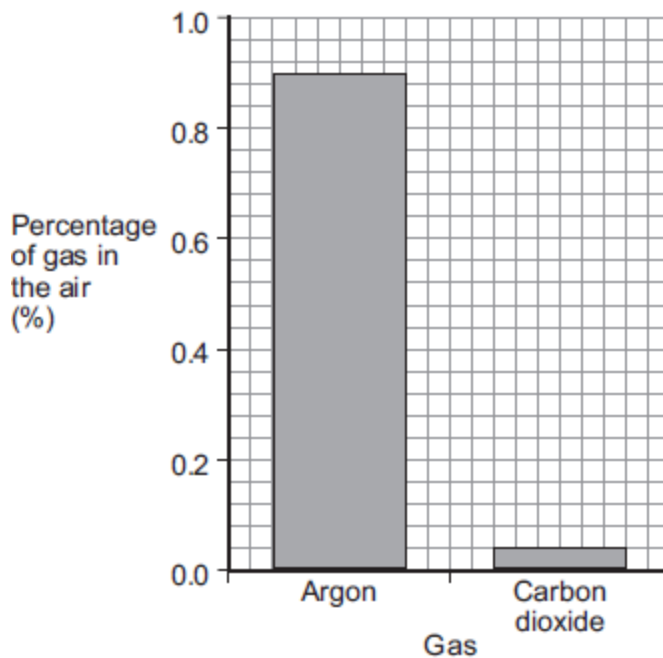
\_\_\_\_\_

Percentage by mass of carbon in carbon monoxide = \_\_\_\_\_%

(1)

(f) Carbon dioxide is one of the gases in the air.

(i) The graph shows the percentage of argon and the percentage of carbon dioxide in the air.



What is the percentage of argon in the air?

Percentage of argon = \_\_\_\_\_ %

(1)

(ii) An instrumental method is used to measure the amount of carbon dioxide in the air.

Give **one** reason for using an instrumental method.

---

---

(1)

(Total 10 marks)

7.

The diagram shows the chemical symbols of five elements in the periodic table.

| Group 1 |    | 2 |  |  |  |  |  |  |  |  |  |  |  | 3 | 4 | 5 | 6 | 7  | 0 |
|---------|----|---|--|--|--|--|--|--|--|--|--|--|--|---|---|---|---|----|---|
|         |    |   |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   | He |   |
|         |    |   |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |    |   |
|         | Na |   |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |    |   |
|         |    |   |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |    |   |
|         |    |   |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |    |   |
|         |    |   |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |    |   |
|         |    |   |  |  |  |  |  |  |  |  |  |  |  |   |   |   |   |    |   |

(a) Choose the correct chemical symbol to complete each sentence.

(i) The element that is an alkali metal is \_\_\_\_\_ .

(1)

(ii) The element that is a transition metal is \_\_\_\_\_ .

(1)

(iii) The element in Group 4 is \_\_\_\_\_ .

(1)

(iv) The element with a full outer energy level (shell) of electrons is

\_\_\_\_\_ .

(1)

(b) Which other element goes in the shaded box?

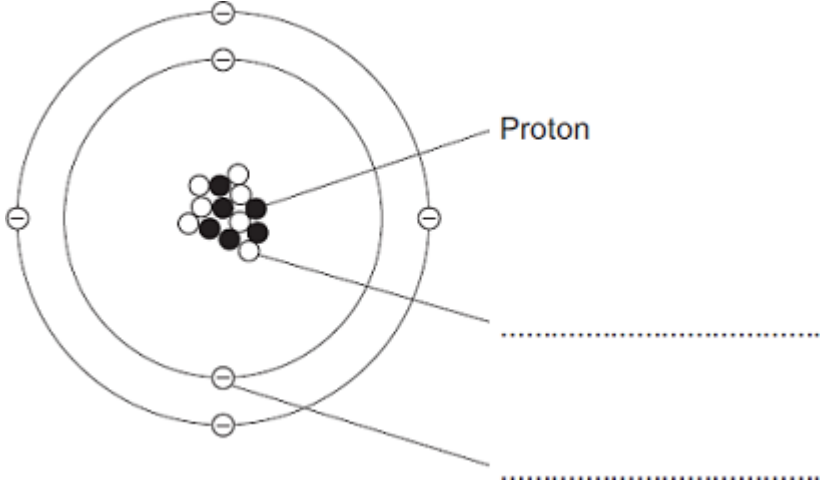
\_\_\_\_\_

(1)

(Total 5 marks)

8.

The diagram shows a carbon atom.





- (a) (i) A proton is labelled.

Use the correct answer from the box to label each of the other sub-atomic particles.

|                 |            |                 |                |
|-----------------|------------|-----------------|----------------|
| <b>electron</b> | <b>ion</b> | <b>molecule</b> | <b>neutron</b> |
|-----------------|------------|-----------------|----------------|

(2)

- (ii) The atom of carbon is represented as:



What is the mass number of this carbon atom?

Draw a ring around the correct answer.

**6**      **13**      **19**

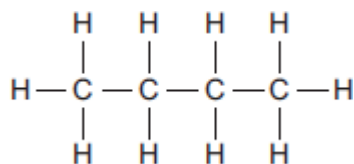
(1)

- (iii) Complete the sentence.

Atoms of carbon have no overall electrical charge because the number of protons is the same as the number of \_\_\_\_\_ .

(1)

- (b) Butane is represented as:



- (i) Use the correct answer from the box to complete each sentence.

|             |                 |               |                 |                |               |
|-------------|-----------------|---------------|-----------------|----------------|---------------|
| <b>bond</b> | <b>compound</b> | <b>helium</b> | <b>hydrogen</b> | <b>mixture</b> | <b>oxygen</b> |
|-------------|-----------------|---------------|-----------------|----------------|---------------|

Butane is a \_\_\_\_\_ .

Butane contains atoms of carbon and \_\_\_\_\_ .

Each line between the atoms in butane represents a chemical

\_\_\_\_\_ .

(3)

(ii) Which is the correct formula for butane?

Tick (✓) **one** box.

C<sub>4</sub>H<sub>4</sub>

C<sub>4</sub>H<sub>8</sub>

C<sub>4</sub>H<sub>10</sub>

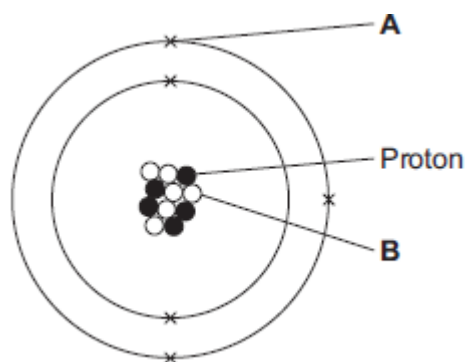
(1)

(Total 8 marks)

9.

(a) **Figure 1** shows an atom of element **G**.

**Figure 1**



Draw a ring around the correct answer to complete each sentence.

(i) Label **A** shows

**an electron**

**an ion**

**a nucleus**

(1)

(ii) The particle labelled **B** is

**an isotope**

**a molecule**

**a neutron**

(1)

(iii) The mass number of element **G** is

**5**

**6**

**11**

(1)

(iv) Use the periodic table to identify element **G**.

Element **G** is

**boron**

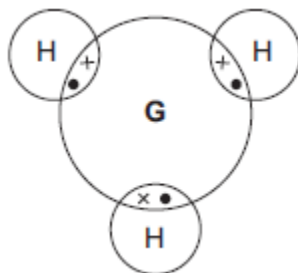
**carbon**

**sodium**

(1)

(b) **Figure 2** shows a compound of **G** and hydrogen.

**Figure 2**



Draw a ring around the correct answer to complete each sentence.

(i) The formula of the compound in **Figure 2** is

**GH<sub>3</sub>**

**G<sub>3</sub>H**

**3HG**

(1)

(ii) The type of bonding shown in **Figure 2** is

**covalent**

**ionic**

**metallic**

(1)

(Total 6 marks)

**10.**

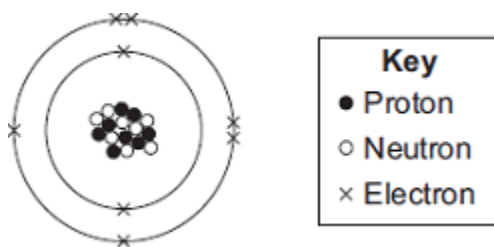
This question is about atoms and molecules.

(a) Complete the table to show the relative masses of the particles in atoms.

| Name of particle | Relative mass |
|------------------|---------------|
| Proton           | _____         |
| Neutron          | 1             |
| Electron         | _____         |

(2)

(b) The diagram shows an oxygen atom.



Use the correct number to complete each sentence.

|          |           |           |           |
|----------|-----------|-----------|-----------|
| <b>8</b> | <b>16</b> | <b>18</b> | <b>24</b> |
|----------|-----------|-----------|-----------|

The atomic (proton) number of the oxygen atom shown above is \_\_\_\_\_ .

The mass number of the oxygen atom shown above is \_\_\_\_\_ .

(2)

(c) (i) Draw a ring around the correct answer to complete each sentence.

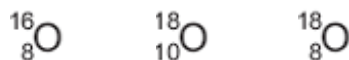
Oxygen atoms with different numbers of neutrons are called

|            |
|------------|
| isotopes.  |
| molecules. |
| polymers.  |

(1)

(ii) An oxygen atom with a different number of neutrons has 10 neutrons.

Draw a ring around the symbol which represents this atom.



(1)

(d) A water molecule contains hydrogen and oxygen atoms.

(i) Use the correct answer to complete the sentence.

|                   |                   |                  |
|-------------------|-------------------|------------------|
| <b>a compound</b> | <b>an element</b> | <b>a mixture</b> |
|-------------------|-------------------|------------------|

Water is \_\_\_\_\_ .

(1)

(ii) Draw a ring around the correct structure of a water molecule.



(1)

(iii) Draw a ring around the type of bonding in a water molecule.

**covalent**

**ionic**

**metallic**

(1)

(iv) Draw a ring around the correct answer to complete each sentence.

The bonds in a water molecule are formed by

gaining

losing

sharing

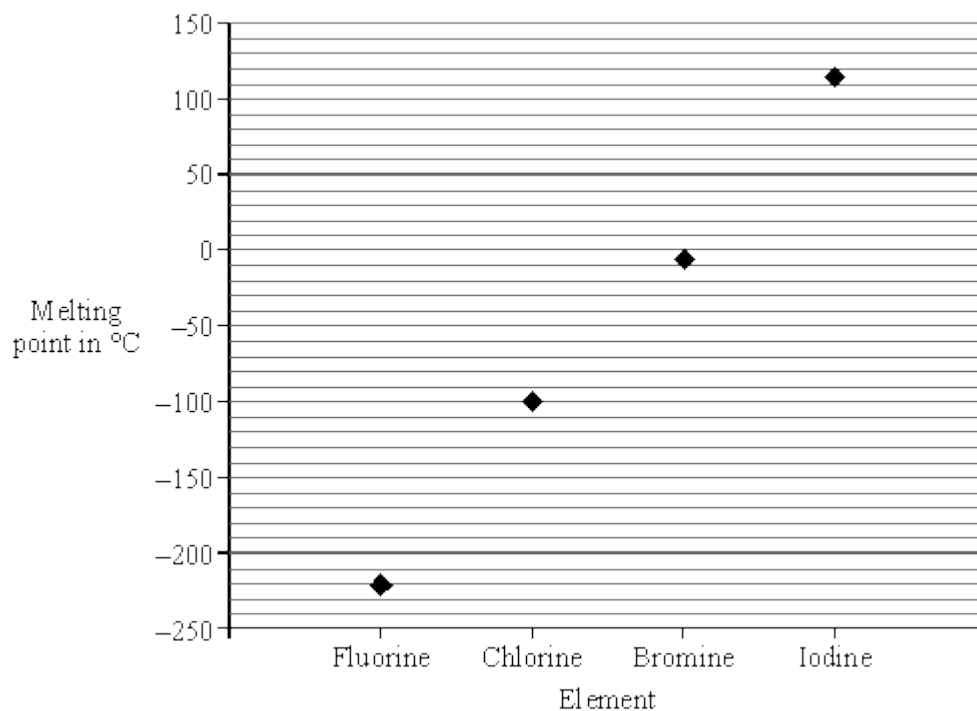
electrons.

(1)

(Total 10 marks)

11.

The graph shows the melting point of four elements in Group 7 of the periodic table.



(a) What is the melting point of fluorine?

---

(1)

(b) Room temperature is 20°C.

Which element is solid at room temperature?

---

(1)

(c) Look at the periodic table on the Data Sheet.

Using data from the graph, describe the trend of melting points of the elements in Group 7.

---

---

---

---

(2)

(d) The elements in Group 7 are non-metals.

Which **two** of the following are properties of non-metals?

Place a tick (✓) in the box against each correct property.

Brittle (if solid)

Good conductor of heat

High boiling point

Poor conductor of electricity

(2)

(Total 6 marks)