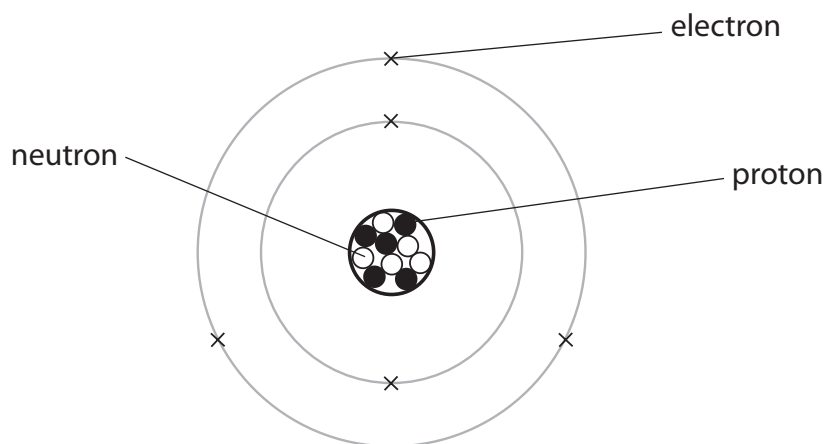


1 Boron exists as two isotopes.

These are boron-10, $^{10}_5\text{B}$, and boron-11, $^{11}_5\text{B}$.

(a) The diagram shows an atom of the isotope, boron-10.



(i) State the electronic configuration of boron.

(1)

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

In the periodic table, boron is in period

(1)

A 2

B 3

C 5

D 10

(iii) The table shows the three particles present in atoms and their relative masses and charges.

Complete the table.

(2)

| particle | relative mass | relative charge |
|----------|------------------|-----------------|
| electron | $\frac{1}{1837}$ | |
| neutron | | |
| proton | | +1 |

- 2 The positions of five elements, **A**, **B**, **C**, **D** and **E**, are shown in the periodic table. These letters are not the atomic symbols of these elements.

| | | | | | | | | | | | | | | | | |
|--|---|----------|--|--|--|--|--|--|----------|--|--|---|---|----------|--|----------|
| | 1 | 2 | | | | | | | | | | 3 | 4 | | | 0 |
| | | | | | | | | | | | | | | | | |
| | | A | | | | | | | | | | | | D | | E |
| | | B | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | C | | | | | | | |

(a) Use only elements **A**, **B**, **C**, **D** and **E** to answer (i) and (ii).

(i) Give the letters of **all** the elements that are metallic.

(1)

(ii) Give the letters of the **two** elements that have the most similar chemical properties.

(1)

(b) An atom of element **B** contains more protons than an atom of element **A**.

State how many more protons there are in an atom of element **B** than in an atom of element **A**.

(1)

(c) An atom of element **E** has atomic number 10 and mass number 22.

(i) How many electrons does this atom contain?

Put a cross (☒) in the box next to your answer.

(1)

A 10

B 12

C 22

D 32

(ii) 10% of the atoms in a sample of element **E** have a mass number of 22.

All the other atoms in this sample have a mass number of 20.

Calculate the relative atomic mass of element **E**.

(3)

.....

.....

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.....

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.....

.....

relative atomic mass =

(d) The element below **E** in the periodic table is used to fill filament light bulbs.

Explain why this element is suitable for this use.

(2)

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(Total for Question 2 = 9 marks)

3 The elements in group 3 of the periodic table are boron, aluminium, gallium, indium and thallium.

(a) Elements can be classified as metals or non-metals.

Explain, using its position in the periodic table, whether indium is a metal or a non-metal.

(2)

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.....

(b) Each aluminium atom has 13 electrons.

State the electronic configuration of an aluminium atom.

(1)

.....

(c) Boron has an atomic number of 5.

There are two isotopes of boron, boron-10 and boron-11.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Every boron atom contains

(1)

- A** five protons
- B** five neutrons
- C** eleven electrons
- D** eleven neutrons

(ii) Explain what is meant by the term **isotopes**.

(2)

.....

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.....

.....

(iii) A sample of boron contains the two isotopes, boron-10 and boron-11.
The relative atomic mass of boron is 10.8

Give the reason why the relative atomic mass is closer to 11 than 10.

(1)

.....

.....

(Total for Question 3 = 7 marks)