**Q1.**

This question is about atomic structure and elements.

(a)     Complete the sentences.

(i)      The atomic number of an atom is the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(1)**

(ii)     The mass number of an atom is the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

**(1)**

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

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

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

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**(2)**

(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.

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

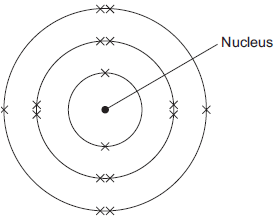
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**(2)**

(d)     The diagram shows the electronic structure of an atom of a non-metal.



What is the chemical symbol of this non-metal?

Tick () **one** box.

|  |  |
| --- | --- |
| Ar |  |
| O |  |
| S |  |
| Si |  |

**(1)**

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

Complete the sentences.

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

particles called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

**(1)**

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

particles called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

**(1)**

**(Total 9 marks)**

Mark schemes

**Q1.**

(a)     (i)      protons

*allow “protons or electrons”, but do not allow “protons and electrons”*

**1**

(ii)     protons plus / and neutrons

**1**

(b)     (because the relative electrical charges are) −(1) for an electron and +(1) for a proton

*allow electrons are negative and protons are positive*

**1**

and the number of electrons is equal to the number of protons

*if no other mark awarded, allow 1 mark for the charges cancel out*

**1**

(c)     (the electronic structure of) fluorine is 2,7 and chlorine is 2,8,7

*allow diagrams for the first marking point*

**1**

(so fluorine and chlorine are in the same group) because they have the same number of or 7 electrons in their highest energy level or outer shell

*if no other mark awarded, allow 1 mark for have the same / similar properties*

**1**

(d)     S

**1**

(e)     (i)      ions

**1**

(ii)     molecules

**1**

**[9]**

Examiner reports

**Q1.**

(a)     (i)      Most students knew that the atomic number was the number of protons. Whilst ‘protons or electrons’ was allowed, quite a few stated, incorrectly, ‘protons and electrons’.

(ii)     The mass number was less well known with a substantial number of students including electrons in their answer.

(b)     The first marking point that protons are positive and electrons are negative was well known, but many students failed to recognise the importance of having equal numbers of these positive and negative particles. Several students stated that electrons are negatively charged and protons positively charged, but then simply stated that the charges cancel out without referring to equal numbers. Occasionally there was some confusion with the identity of particular particles, for example ‘protons are positively charged ions and electrons are negatively charged ions’. Some answers were confused and mentioned loss and gain of electrons and a surprising number of students thought that neutrons were charged.

(c)     The majority of responses gained at least one mark for correctly stating that chlorine and fluorine had the same number of outer electrons; this was often linked to them having similar properties. A poor attempt or no attempt was made at giving their electronic structure; clearly some students had not read the question. Incorrect responses included: same electronic structure, having eight outer electrons and being non-metals.

(d)     The majority of students were able to link the electronic structure to the correct chemical symbol.

(e)     (i)      Less than half of the students identified the particles as ions.

(ii)     Few knew that compounds formed from only non-metals consist of particles called molecules. Common responses made reference to the type of compound, ‘covalent’, rather than the particles formed. Nearly one in ten students did not attempt an answer, more than on any other question.