

**0 3**

Structure and bonding is used to explain properties of compounds.

Metal atoms react with non-metal atoms to form ions.

**0 3 . 1**Which group of elements does **not** form ions?**[1 mark]**Tick (✓) **one** box.

Alkali metals

Halogens

Noble gases

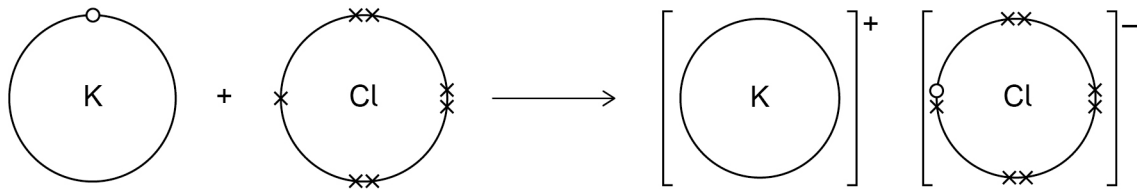
**Question 3 continues on the next page****Turn over ►**

**0 3 . 2** Potassium reacts with chlorine to produce potassium chloride (KCl).

**Figure 6** shows what happens to the electrons in the outer shells when a potassium atom reacts with a chlorine atom.

The dots (o) and crosses (x) represent electrons.

**Figure 6**



Describe what happens when a potassium atom reacts with a chlorine atom to produce potassium chloride.

Answer in terms of electrons.

**[4 marks]**

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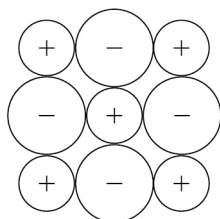
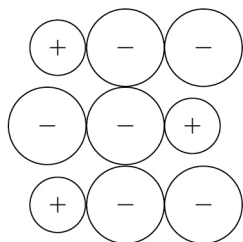
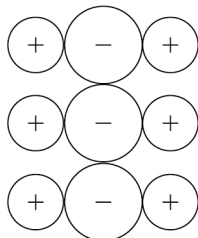
**0 3 . 3**

In solid ionic compounds, oppositely charged ions attract to form a giant structure.

Which structure represents the arrangement of ions in solid potassium chloride?

**[1 mark]**

Tick (✓) **one** box.



**Question 3 continues on the next page**

**Turn over ►**

Non-metal atoms share electrons to form covalent bonds.

**0 3 . 4** Water ( $\text{H}_2\text{O}$ ) is a covalent molecule.

**Table 2** shows the number of electrons in the outer shells of hydrogen atoms and of oxygen atoms.

**Table 2**

Element	Number of electrons in the outer shell of an atom
Hydrogen	1
Oxygen	6

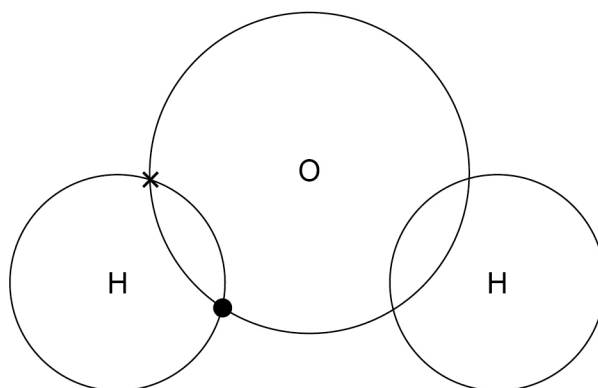
**Figure 7** shows part of a dot and cross diagram for a molecule of water.

Complete the dot and cross diagram.

You should only show electrons in the outer shells.

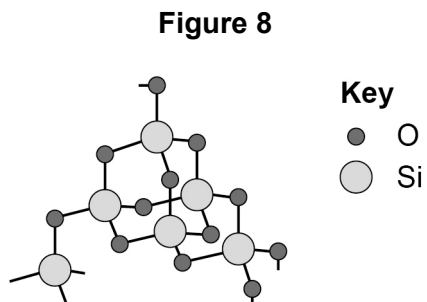
**[2 marks]**

**Figure 7**



**0 3 . 5** Silica has a giant covalent structure.

**Figure 8** represents the structure of silica.



Determine the ratio of silicon (Si) atoms to oxygen (O) atoms in silica.

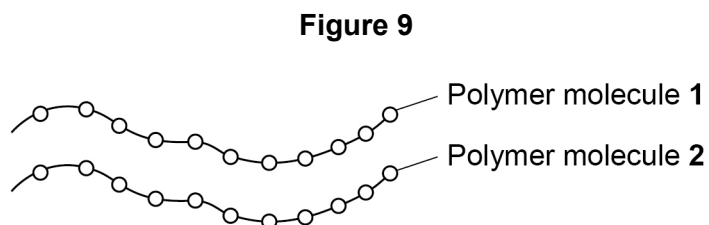
Use **Figure 8**.

**[1 mark]**

\_\_\_\_\_ Si : \_\_\_\_\_ O

**0 3 . 6** Polymers have very large molecules.

**Figure 9** represents part of the structure of a polymer.



What holds polymer molecule **1** and polymer molecule **2** together in a polymer?

**[1 mark]**

Tick (✓) **one** box.

Covalent bonds

Electrostatic attraction between ions

Weak intermolecular forces

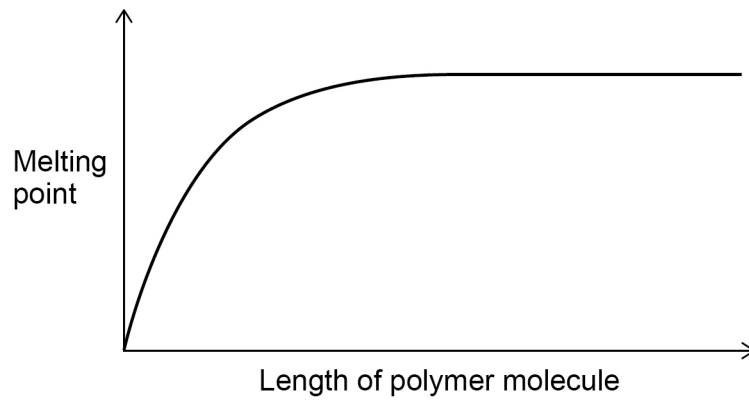
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0 3 . 7

**Figure 10** shows the melting point of a polymer as the length of the polymer molecule increases.

**Figure 10**



Describe the trend shown in **Figure 10**.

**[3 marks]**

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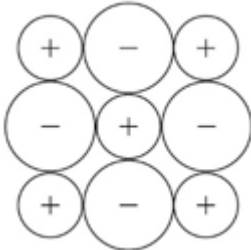
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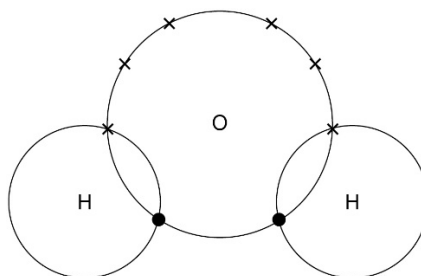
**Question 3**

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	noble gases		1	AO1 5.2.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	potassium (atoms) lose electrons		1	AO2
	chlorine (atoms) gain electrons		1	AO2
	reference to one electron		1	AO2
	any <b>one</b> from: <ul style="list-style-type: none"> <li>• to form ions</li> <li>• to form full outer shell(s)</li> <li>• to form full energy level(s)</li> </ul>		1	AO1  5.2.1.2
		allow to form a noble gas structure		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3			1	AO2 5.2.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	one shared pair in each overlap	allow any combination of circles, dots, crosses, e <sup>(-)</sup> for electrons	1	AO1 5.2.1.1 5.2.1.4
	four non-bonding electrons in outer shell of oxygen	do <b>not</b> accept extra electron(s) on outer shell of hydrogen  ignore any inner shell electrons  the diagram below scores 2 marks	1	



Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	1 Si : 2 O	allow 6 Si : 12 O	1	AO3 5.2.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	weak intermolecular forces		1	AO1 5.2.2.5



Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	the melting point increases as the length of the polymer molecule increases	ignore references to boiling point  allow 1 mark for melting point increases	2	AO3 5.2.2.4 5.2.2.5
	(then the) melting point levels off (as the polymer molecule length increases)	allow (then the) melting point becomes constant (as the polymer molecule length increases)	1	

<b>Total Question 3</b>	<b>13</b>
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