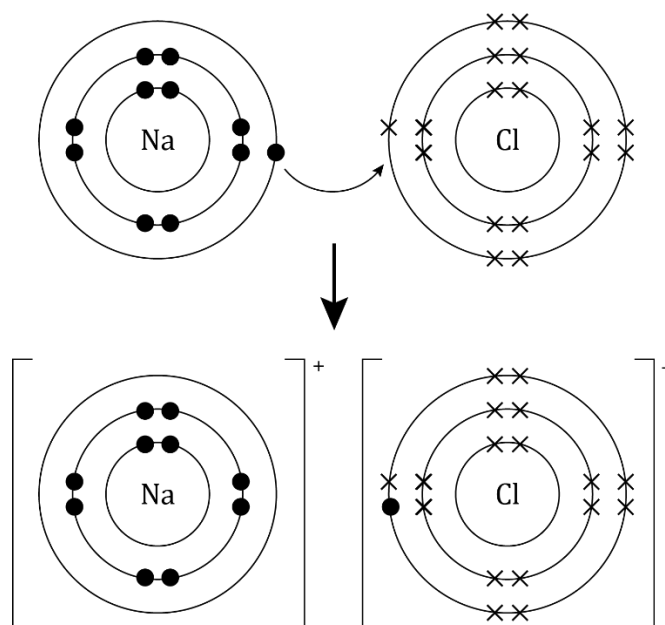


Ionic structure and bonding

- 1 Sodium metal reacts with chlorine gas to form the ionic compound sodium chloride. The diagram shows how the electrons are rearranged in the ions formed.



(a) What is the electronic configuration of:

- i. a sodium atom? _____
- ii. a chlorine atom? _____
- iii. a sodium ion? _____
- iv. a chloride ion? _____

(4 marks)

(b) Which statement about a chloride ion is true?
Circle the correct answer.

(1 mark)

- A** A chloride ion has equal numbers of electrons and protons.
- B** A chloride ion has more electrons than protons.
- C** A chloride ion has more electrons than protons.
- D** A chloride ion has fewer electrons than a chlorine atom.

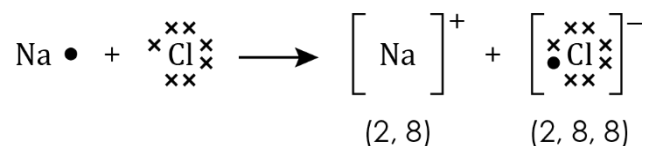
- (c) Describe how sodium and chlorine atoms form sodium and chloride ions. Use the words to complete the sentences.

positive stable seven negative one

A sodium atom has _____ electron in its outer shell. A chlorine atom has _____ electrons in its outer shell. The outer electron from a sodium atom is transferred to a chlorine atom. The sodium ion formed has a _____ charge. The chloride ion has a _____ charge. Both ions have a _____ electronic configuration.

(5 marks)

- (d) The reaction between sodium and chlorine can be represented as:



Draw a similar diagram to show how lithium (2, 1) and fluorine (2, 7) form lithium fluoride.

(3 marks)

2 This question is about magnesium oxide and magnesium chloride.

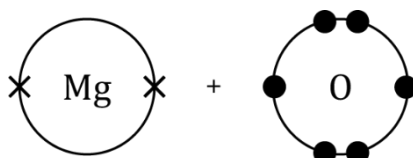
(a) Magnesium is in group 2. State the charge on a magnesium ion.

_____ (1 mark)

(b) Oxygen is in group 6. State the charge on an oxide ion.

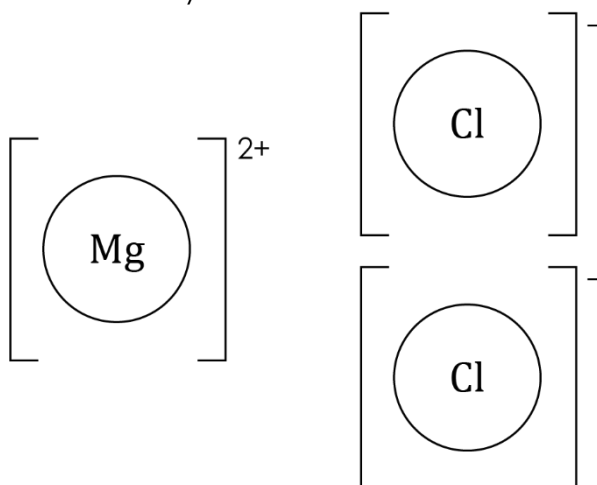
_____ (1 mark)

(c) Complete the diagram to show the formation of magnesium oxide. Add the dots and crosses to represent the electrons and add the charges on the ions formed.



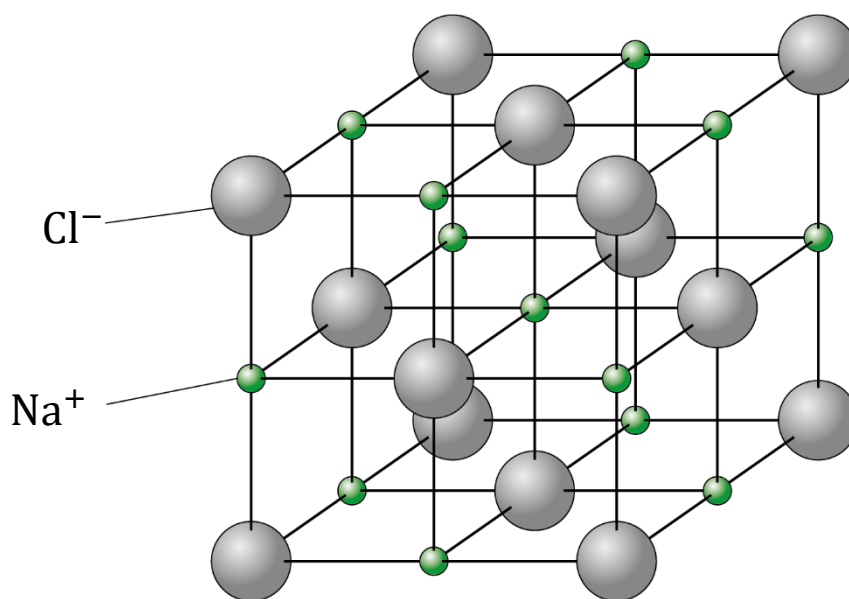
(2 marks)

(d) Complete the dot and cross diagram for magnesium chloride. Show the outer electrons only.



(3 marks)

- 3 This diagram represents the giant ionic structure of sodium chloride.



- (a) What forces hold the giant structure together?

Circle the correct answer.

- A atomic forces
- B covalent forces
- C electrostatic forces
- D intermolecular forces

(1 mark)

- (b) The melting point of sodium chloride is 801°C .

- i. What type of bonding is broken when sodium chloride melts?

(1 mark)

- ii. Explain why sodium chloride has a relatively high melting point.

(2 marks)

- 4 Zinc chloride is an ionic compound. Some students investigated the electrical conductivity of solid zinc chloride, zinc chloride solution and molten zinc chloride.
- The table shows some of their results:

Substance	Did it conduct electricity?
solid zinc chloride	no
zinc chloride solution	yes

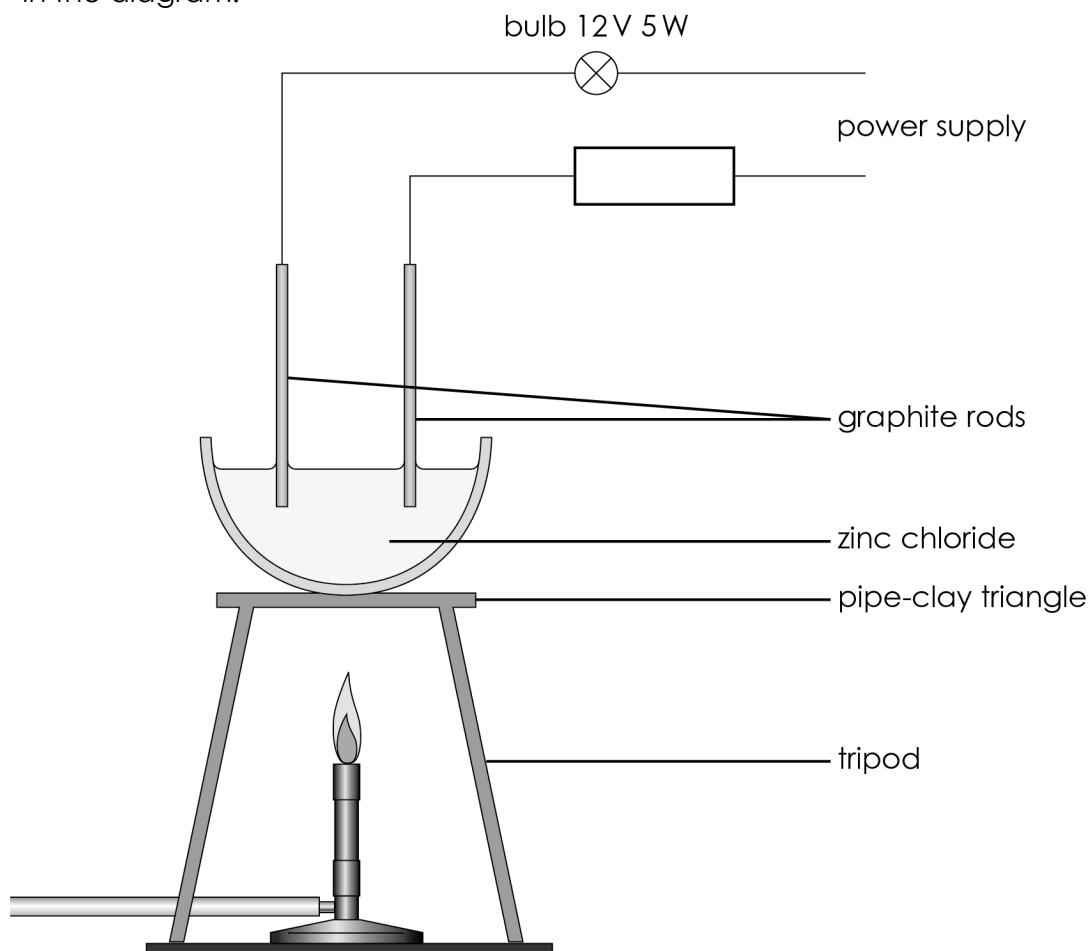
- (a) Which statement best explains why zinc chloride solution conducts electricity?

Circle the correct answer.

- A The ions are held in place by electrostatic forces.
- B The ions are free to move and carry the charge.
- C Water does not conduct electricity.
- D Zinc chloride is soluble in water.

(1 mark)

- (b) The students then observed an experiment using molten zinc chloride as shown in the diagram.



Explain why the bulb lit up when the zinc chloride melted.

Hint: Look at your answer to **question 4(a)** to help you write your explanation.

(2 marks)

[Total: 27 marks]



Which question(s) did you get wrong? Why?

What will you do next time you're asked a similar question?