

# IONIC BONDING 1

**Q1.** Sodium iodide can be produced from kelp.

**(i)** How many electrons are in the outer shell of an iodine atom?

---

(1 mark)

**(ii)** Sodium iodide contains sodium ions ( $\text{Na}^+$ ) and iodide ions ( $\text{I}^-$ ). Describe, as fully as you can, what happens when sodium atoms react with iodine atoms to produce sodium iodide.

---

---

---

---

---

---

---

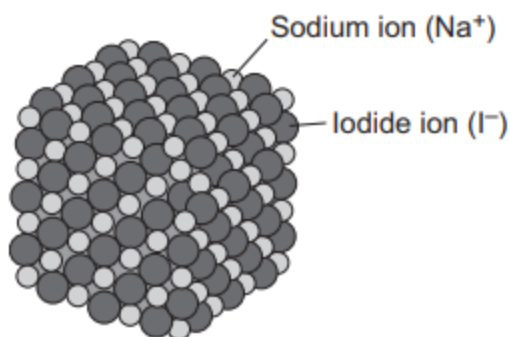
---

---

---

(3 marks)

**(iii)** The diagram shows the structure of sodium iodide.



Solid sodium iodide does not conduct electricity.

Why does sodium iodide solution conduct electricity?

---

---

(1 mark)

**Q2.** Calcium hydroxide has the formula  $\text{Ca}(\text{OH})_2$ .

Why are there two hydroxide ions for each calcium ion in the formula?

---

---

(1 mark)

**Q3.** Distress flares are used to attract attention in an emergency.



Flares often contain the element magnesium. Magnesium burns to form magnesium oxide.

**(a)** Write a balanced symbol equation for the reaction between magnesium ( $\text{Mg}$ ) and oxygen ( $\text{O}_2$ ) to form magnesium oxide ( $\text{MgO}$ ).

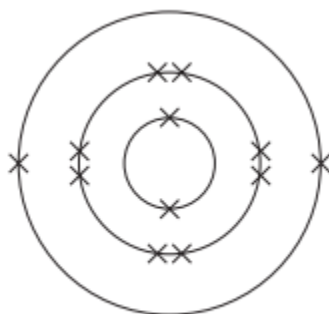
---

---

(1 mark)

**(b)** The diagram shows the electronic structure of a magnesium atom.

The atomic (proton) number of magnesium is 12.



**Magnesium atom**

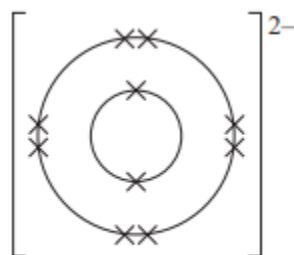
Draw a similar diagram to show the electronic structure of an oxygen atom.

The atomic (proton) number of oxygen is 8.

(1 mark)

**(c)** Magnesium ions and oxide ions are formed when magnesium reacts with oxygen.

The diagram shows the electronic structure of an oxide ion.



**Oxide ion**

Draw a similar diagram to show the electronic structure of a magnesium ion.

(1 mark)

**(d)** Magnesium oxide is a white solid with a high melting point.

Explain how the ions are held together in solid magnesium oxide.

---

---

---

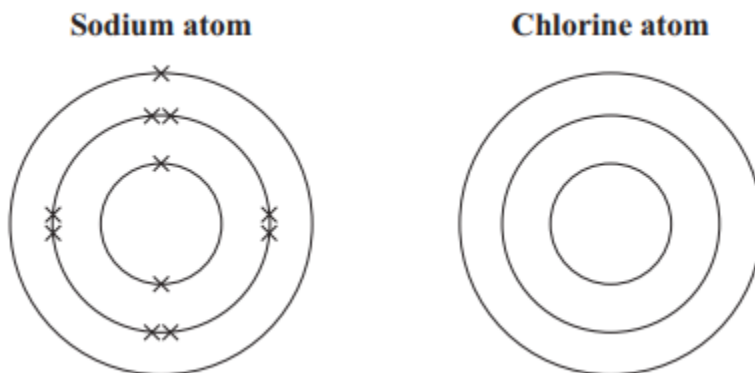
---

(2 marks)

**Q4.** Sodium chloride is a raw material.

**(a)** The electronic structure of a sodium atom is shown below.

Complete the diagram for the electronic structure of a chlorine atom. A chlorine atom has 17 electrons.



(1 mark)

**(b)** When sodium and chlorine react to form sodium chloride they form sodium ions ( $\text{Na}^+$ ) and chloride ions ( $\text{Cl}^-$ ).

How does a sodium atom change into a sodium ion?

---

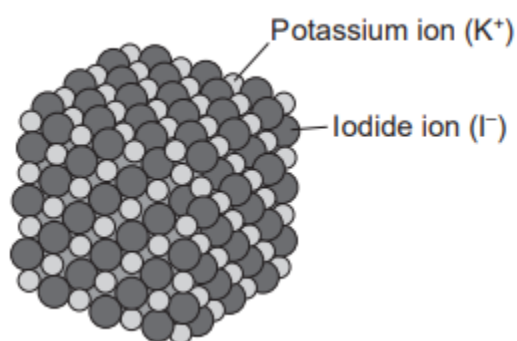
---

---

---

(2 marks)

**Q5.** The diagram shows the structure of potassium iodide.



**(a)** Explain why a high temperature is needed to melt potassium iodide.

---

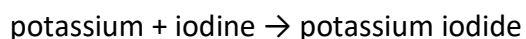
---

---

---

(2 marks)

**(b)** Potassium can be reacted with iodine to produce potassium iodide.



The diagram shows how this happens.

Only the outer electrons are shown.

The dots (•) and crosses (×) are used to represent electrons.



Use the diagram to help you answer this question.

Describe, as fully as you can, what happens when potassium reacts with iodine to produce potassium iodide.

To get full marks you should use the words atom, electron and ion in your answer.

---



---



---



---



---



---



---



---



---



---



---



---



---



---



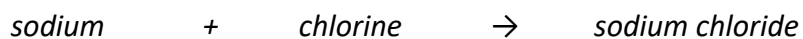
---



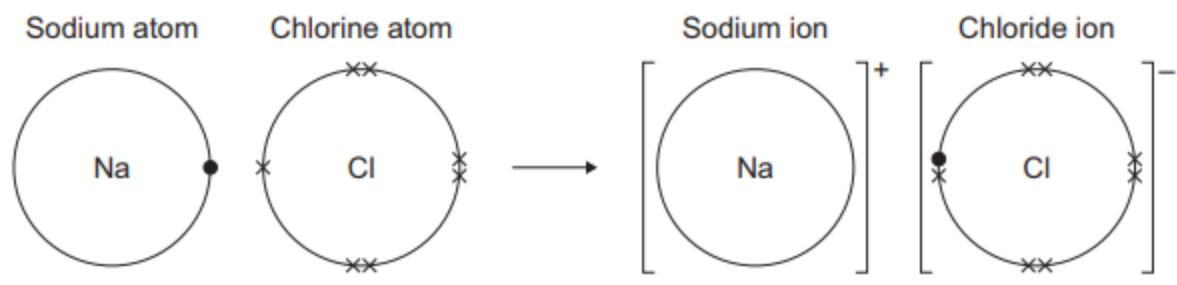
---

(4 marks)

**Q6.** Sodium reacts with chlorine to produce sodium chloride.



**(a)** The diagram shows how the reaction happens. Only the outer electrons are shown.



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

(i)

A sodium atom changes into a sodium ion by gaining  
losing  
sharing an electron.

(1 mark)

(ii)

A sodium ion has a negative  
no  
a positive charge.

(1 mark)

(iii)

The ions in sodium chloride are held together by strong 

covalent
electrostatic
magnetic

 forces.

(1 mark)

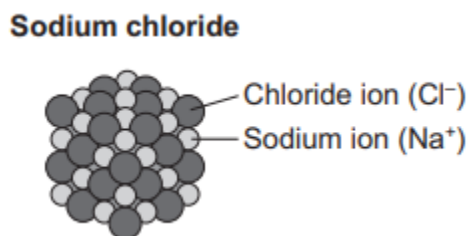
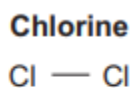
(b) Sodium chloride is an ionic compound. Tick (✓) two properties of ionic compounds.

Property	Tick (✓)
Do <b>not</b> dissolve in water	
High melting points	
Low boiling points	
Strong bonds	

(2 mark)

**Q7. In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Explain why chlorine ( $\text{Cl}_2$ ) is a gas at room temperature, but sodium chloride ( $\text{NaCl}$ ) is a solid at room temperature.



Include a description of the bonding and structure of chlorine and sodium chloride in your answer.

---

---

---

---



