

Exercise walk-through

Ions and ionic bonds ■ 2.4

eXercise

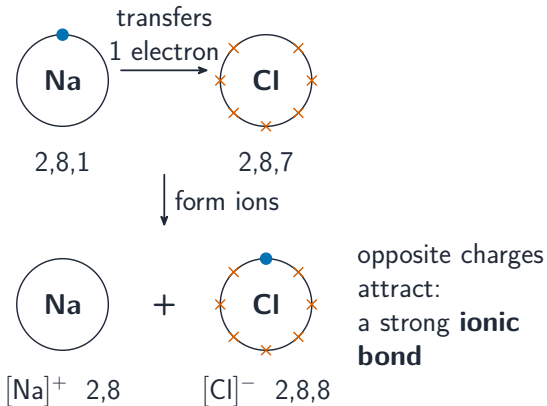
You must be able to

- explain how metals/non-metals form ions (to gain a full outer shell)
- describe ionic bonding (electron transfer; electrostatic attraction)
- explain the properties of ionic compounds from their structure

Method — Ionic bonding and lattice

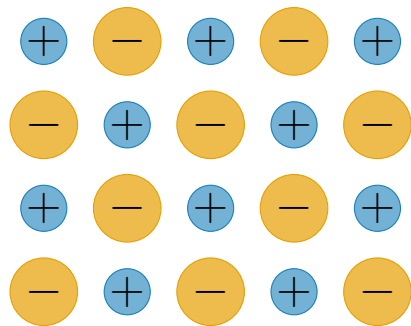
- **ionic compounds:** high melting point; conduct only when molten/aqueous (ions free to move).

Method — Ionic bonding and lattice



Sodium's outer electron transfers to chlorine, forming Na and Cl

Method — Ionic bonding and lattice



a regular, repeating
3-D pattern of alternating + and - ions

A lattice of alternating Na and Cl ions

Practice 2.1 ■ 1 mark

State the charge on an ion formed when a metal atom loses electrons.

Solution 2.1

Worked steps

a positive charge (a cation) **B1**.

Practice 2.2 ■ 1 mark

Define an ionic bond.

Solution 2.2

Worked steps

the strong electrostatic attraction between oppositely charged ions **B1**.

Exam-style 3.1 ■ 1 mark

Ionic compounds conduct electricity when:

- A** solid
- B** molten or in solution
- C** never
- D** only as a gas

Solution 3.1

Method: Ionic bonding and lattice

- A solid
- B molten or in solution**
- C never
- D only as a gas



Worked steps

B. Ionic compounds conduct when molten or in solution.

Exam-style 3.2 ■ 3 marks

Sodium (2, 8, 1) reacts with chlorine (2, 8, 7) to form sodium chloride.

- (a) Describe what happens to the electrons, and give the charges of the two ions.
- (b) Explain why sodium chloride has a high melting point.

Solution 3.2

Method: Ionic bonding and lattice

Worked steps

- (a) sodium gives its one outer electron to chlorine (M1); sodium becomes Na^+ and chlorine becomes Cl^- (A1); both then have full outer shells (A1).
- (b) there is strong electrostatic attraction between the oppositely charged ions in the lattice (M1); a lot of energy is needed to break it (A1).

Exam-style 3.3 ■ 2 marks

Explain why solid sodium chloride does not conduct electricity but molten sodium chloride does.

Solution 3.3

Method: Ionic bonding and lattice

Worked steps

in the solid the ions are fixed in place and cannot move **M1**; when molten the ions are free to move and carry charge **A1**.