

2.4 Ions and ionic bonds

Name: _____ Class: _____ Date: _____

Total: 10 marks**KEY WORDS** cation 阳离子 • ionic compound 离子化合物 • molten 熔融 • metal 金属 • melting point 熔点

Objective

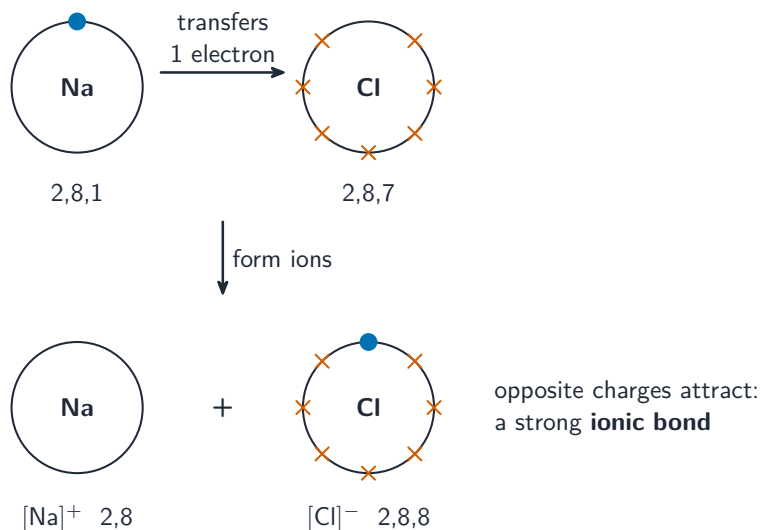
Build the skills to answer exam questions on **ions and ionic bonds** 离子与离子键 — ion formation, the **ionic bond** 离子键, the giant **lattice** 晶格, and the properties of ionic compounds.

You must be able to:

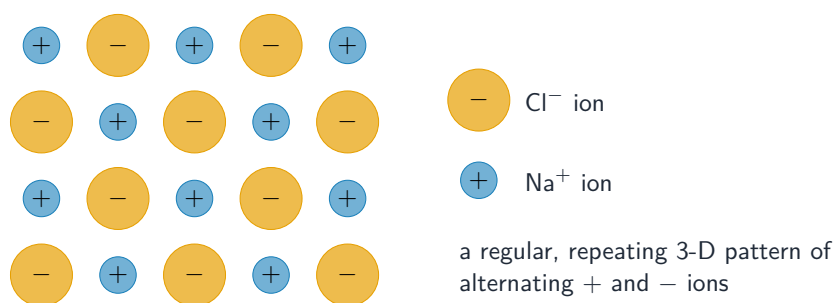
- explain how metals/non-metals form ions (to gain a full outer shell)
- describe ionic bonding (electron transfer; electrostatic attraction)
- explain the properties of ionic compounds from their structure

1 Worked examples

■ Ionic bonding and lattice



A metal gives electron(s) to a non-metal; both reach full outer shells and the opposite charges attract



Ions pack into a giant lattice of alternating + and - ions

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

2 Practice

2.1 State the charge on an ion formed when a metal atom loses electrons. [1]

2.2 Define an ionic bond. [1]

3 Exam-style questions

3.1 Ionic compounds conduct electricity when: [1]

- **A** solid
 - **B** molten or in solution
 - **C** never
 - **D** only as a gas
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3.2 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. [3]

(b) Explain why sodium chloride has a high melting point. [2]

3.3 Explain why solid sodium chloride does not conduct electricity but molten sodium chloride does. [2]

Solutions

2.1 a positive charge (a cation).

2.2 the strong electrostatic attraction between oppositely charged ions.

3.1 B. Ionic compounds conduct when molten or in solution.

3.2 (a) sodium gives its one outer electron to chlorine; sodium becomes Na^+ and chlorine becomes Cl^- ; both then have full outer shells.

(b) there is strong electrostatic attraction between the oppositely charged ions in the lattice; a lot of energy is needed to break it.

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