

3.3 Metallic bonding

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS delocalised electrons 离域电子 • metallic bonding 金属键 • electron 电子
• ion 离子 • electrostatic attraction 静电引力

Objective

Build the skills to answer exam questions on **metallic bonding** — defining it and using it to explain the properties of metals.

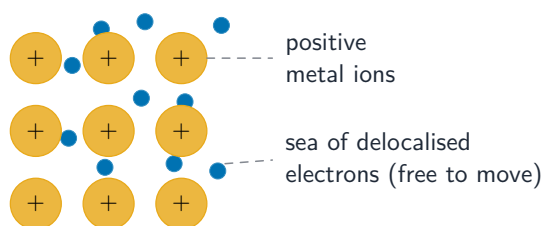
You must be able to:

- define metallic bonding as the attraction between positive metal ions and delocalised electrons
- use it to explain electrical conductivity and strength

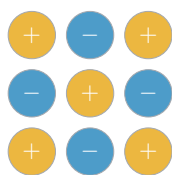
1 Worked examples

■ Metallic bonding

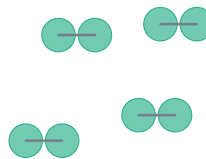
Metallic bonding 金属键 is the **electrostatic attraction** between positive metal ions and a “sea” of **delocalised electrons** 离域电子.



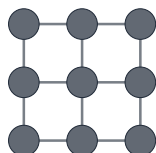
Positive metal ions sit in a sea of delocalised electrons that are free to move



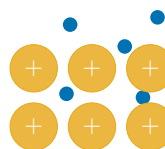
giant ionic
NaCl: high m.p.,
conducts when molten



simple molecular
I₂, ice: low m.p.,
weak forces between



giant covalent
diamond, SiO₂: very
high m.p., insulating



giant metallic
copper: high m.p.,
conducts (solid + molten)

The metallic lattice among the four structures

The free electrons explain why metals **conduct electricity** (the electrons move and carry charge) and are **strong** (the attraction acts throughout the lattice).

2 Practice

2.1 Define **metallic bonding**.

[2]

2.2 Name the particles that carry charge when a metal conducts electricity.

[1]

3 Exam-style questions

3.1 Metals conduct electricity because they contain:

[1]

A	B
C	D

- A oppositely charged ions
- B delocalised electrons that are free to move
- C shared pairs of electrons
- D weak intermolecular forces

3.2 Explain, in terms of metallic bonding, why metals are good conductors of electricity.[2]

3.3 Magnesium has a higher melting point than sodium. Suggest why, in terms of metallic bonding. [2]
