

3 Chemical bonding – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
electrons	电子	_____	_____	_____
Electronegativity	电负性	_____	_____	_____
nuclear charge	核电荷	_____	_____	_____
atomic radius	原子半径	_____	_____	_____
shielding	屏蔽	_____	_____	_____
ionic bonding	离子键	_____	_____	_____
ions	离子	_____	_____	_____
covalent bonding	共价键	_____	_____	_____
metallic bonding	金属键	_____	_____	_____
delocalised electrons	离域电子	_____	_____	_____
coordinate bond	配位键	_____	_____	_____

Recall

At IGCSE you met **ionic**, **covalent** and **metallic** bonding. Now we explain *why* atoms pull on electrons, and draw the bonds more carefully.

- A bond is really about where the **electrons** 电子 go.
- Some atoms pull electrons harder than others.

Nothing here is harder than IGCSE — it just adds the right words.

New ideas

Read these first, then do the Practice.

■ 1 Electronegativity

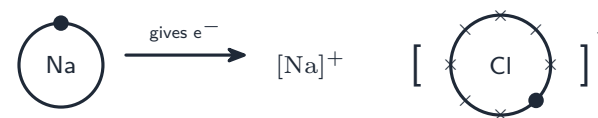
Electronegativity 电负性 is the power of an atom to attract the electrons in a bond towards itself. It depends on:

- **nuclear charge** 核电荷 — more protons pull harder.
- **atomic radius** 原子半径 — closer to the nucleus pulls harder.
- **shielding** 屏蔽 — more inner shells weaken the pull.

So it **rises** across a period and **falls** down a group. **Fluorine** is the most electronegative element.

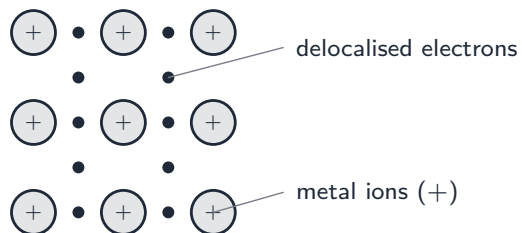
■ 2 The three strong bonds

- **ionic bonding** 离子键 — the attraction between oppositely charged **ions** 离子 (a metal gives electrons to a non-metal).
- **covalent bonding** 共价键 — a **shared pair** of electrons between two atoms.
- **metallic bonding** 金属键 — positive metal ions in a “sea” of **delocalised electrons** 离域电子.



■ 3 Metallic bonding

The outer electrons are free to move through the whole metal. This is why metals **conduct electricity** and are strong.



■ 4 Coordinate bonds

A **coordinate bond** 配位键 (dative bond) is a covalent bond where **both** shared electrons come from the **same** atom. Example: the lone pair on nitrogen forms the fourth N-H bond in the ammonium ion, NH_4^+ .

Watch out: ionic and covalent are the two ends of a scale — the *bigger* the electronegativity difference between the atoms, the more ionic the bond; two identical atoms share the electrons equally (pure covalent).

Practice

Try these in order.

3.1 Define *electronegativity*. [1]

3.2 Which is the most electronegative element? [1]

3.3 State how electronegativity changes (a) across a period, (b) down a group. [2]

3.4 Define *ionic bonding*. [2]

3.5 Explain why metals conduct electricity, using the idea of delocalised electrons. [2]

3.6 What is a *coordinate (dative) bond*? [1]

3.7 Challenge. Using electronegativity, explain why the bond between sodium and chlorine is ionic, while the bond between the two chlorine atoms in Cl_2 is covalent. [2]
