

# 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

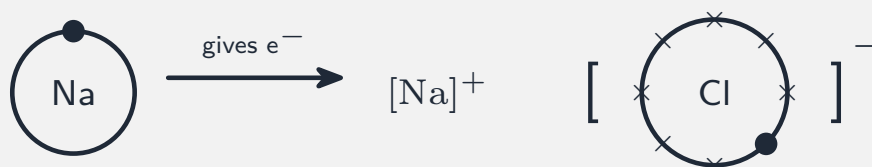
**Electronegativity** 电负性 is the power of an atom to attract the electrons in a bond towards itself. It depends on:

- **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.

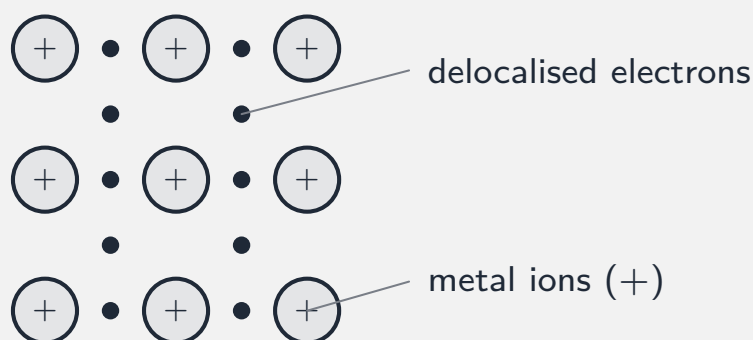
### ■ 2 The three strong bonds

- **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,  $\text{NH}_4^+$ .

**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]

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**3.2** Which is the most electronegative element? [1]

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

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**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  $\text{Cl}_2$  is covalent. [2]