

# 9 Rusting and extraction – Part 2

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) |       |       |
|------------------------|---------|----------------------------|-------|-------|
| reactivity series      | 金属活动性顺序 | _____                      | _____ | _____ |
| rusts                  | 生锈      | _____                      | _____ | _____ |
| extract                | 提取      | _____                      | _____ | _____ |
| ores                   | 矿石      | _____                      | _____ | _____ |
| Rusting                | 生锈      | _____                      | _____ | _____ |
| oxygen                 | 氧气      | _____                      | _____ | _____ |
| barrier methods        | 隔离法     | _____                      | _____ | _____ |
| galvanising            | 镀锌      | _____                      | _____ | _____ |
| sacrificial protection | 牺牲保护    | _____                      | _____ | _____ |
| blast furnace          | 高炉      | _____                      | _____ | _____ |
| electrolysis           | 电解      | _____                      | _____ | _____ |

## Recall

From Part 1 you know the **reactivity series** 金属活动性顺序. It explains why iron **rusts** 生锈 and how we **extract** 提取 metals from their **ores** 矿石.

- Rusting is the corrosion of iron.
- A metal's place in the series decides how it is extracted.

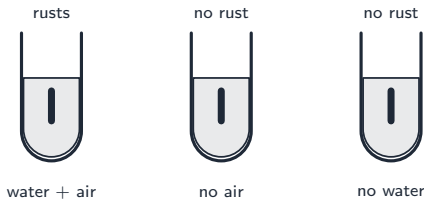
Nothing here is hard — it just applies the order.

## New ideas

Read these first, then do the Practice.

### ■ 1 Rusting

**Rusting** 生锈 is the corrosion of iron. It needs **two** things: **oxygen** 氧气 (from the air) **and** water.



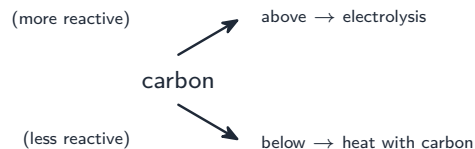
### Stopping rust:

- **barrier methods** 隔离法 — paint, oil/grease or plastic keep out air and water.
- **galvanising** 镀锌 — coat with **zinc**; the zinc also gives **sacrificial protection** 牺牲保护 (being more reactive, it corrodes instead of the iron).

### ■ 2 Extracting metals

How a metal is taken from its ore depends on its reactivity:

- metals **below carbon** in the series → heat the ore **with carbon** (carbon removes the oxygen). Iron is made this way in a **blast furnace** 高炉.
- metals **above carbon** are too reactive → extracted by **electrolysis** 电解. Aluminium is made this way.



**Watch out:** rusting needs **both** oxygen **and** water — remove either and iron will not rust. A metal **below** carbon is extracted by heating its ore *with carbon*; one **above** carbon is too reactive and needs **electrolysis**.

### Practice

Try these in order.

9.1 What two substances are needed for iron to rust? [2]

9.2 Name the rust formed (its chemical name). [1]

9.3 Galvanising protects iron in two ways. State them. [2]

9.4 Why does the more reactive zinc protect the iron, even if the surface is scratched? [2]

9.5 How is (a) iron, (b) aluminium extracted from its ore? [2]

**9.6 Challenge.** Aluminium is above carbon in the reactivity series, but iron is below it. Explain why aluminium must be extracted by electrolysis while iron can be extracted with carbon. [3]