IGCSE CHEMISTRY • EXERCISE SHEET

# 9.1 Properties of metals

Name: _____ Class: _____ Date: _____ **Total: 22 marks**

**KEY WORDS** metals 金属 • oxygen 氧气 • copper 铜 • oxide 氧化物 • salt 盐

## Objective

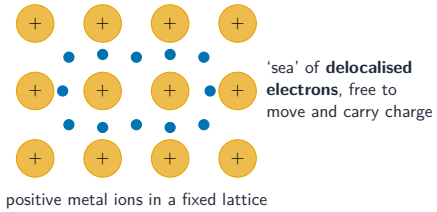
Build the skills to answer exam questions on the **properties of metals** 金属的性质 — physical properties vs non-metals, and the chemical reactions of metals.

**You must be able to:**

- contrast the physical properties of metals and non-metals
- give the products of metals with acids, water/steam and oxygen
- link properties to uses

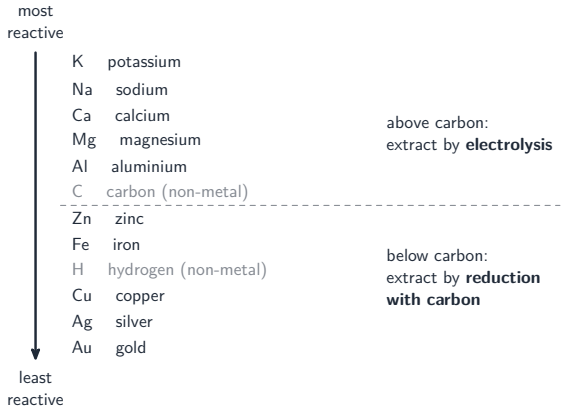
## 1 Worked examples

### Metal properties




*Delocalised electrons make metals good conductors; sliding layers make them malleable*






*Reactivity is a key chemical property of a metal*

- **metals:** good conductors, malleable/ductile, high melting points.
- **reactions:** + acid → salt + hydrogen; + oxygen → metal oxide; + water/steam → hydroxide/oxide + hydrogen.

## 2 Practice

**2.1** State two physical properties of metals. [2]

**2.2** Give the products when a metal reacts with a dilute acid. [1]

## 3 Exam-style questions

**3.1** Which property is typical of a non-metal? [1]

- **A** good electrical conductor
- **B** malleable
- **C** brittle
- **D** high density

**3.2** Magnesium reacts with dilute hydrochloric acid.

(a) Name the two products. [2]

(b) Name the gas given off and a test for it. [2]

**3.3** State why metals are good electrical conductors. [1]



**3.4** Four metals — copper, magnesium, iron and zinc — are tested with cold water, steam and dilute hydrochloric acid.

(a) State **three** physical properties that most metals have and most non-metals do not. [3]

(b) Only magnesium reacts noticeably with cold water; copper reacts with neither steam nor acid. Place the four metals in order of reactivity, most reactive first, and explain how the tests justify your order. [4]

(c) Write the word equation and the balanced symbol equation for zinc reacting with dilute hydrochloric acid. [3]

(d) A piece of magnesium is placed in copper(II) sulfate solution. Predict what you would see, and write the ionic equation. [3]

## Solutions

**2.1** any two of: good conductor of heat/electricity; malleable; ductile; high melting point.

**2.2** a salt + hydrogen.

**3.1 C**. Non-metals are usually brittle.

**3.2** (a) magnesium chloride; hydrogen.
(b) hydrogen; it gives a 'squeaky pop' with a lighted splint.

**3.3** they have delocalised (free) electrons that can move and carry charge.

**3.4** (a) Any three of: shiny when freshly cut; good conductors of heat and electricity; malleable and ductile rather than brittle; high melting point and high density; sonorous.
(b) magnesium, zinc, iron, copper. Magnesium is the only one to react with **cold water**, so it is the most reactive; copper reacts with neither steam nor acid, so it is the least reactive; zinc and iron both react with acid, and zinc does so faster and more vigorously, so zinc is above iron.
(c) zinc + hydrochloric acid → zinc chloride + hydrogen; $Zn + 2HCl \rightarrow ZnCl_2 + H_2$.
(d) The blue solution fades and a pink-brown solid (copper) coats the magnesium; $Mg + Cu^{2+} \rightarrow Mg^{2+} + Cu$ — magnesium is more reactive, so it displaces the copper.