

9.6 Extraction of metals

Name: _____ Class: _____ Date: _____

Total: 8 marks**KEY WORDS** blast furnace 高炉 • reduction 还原 • electrolysis 电解 • limestone 石灰石 • cathode 阴极

Objective

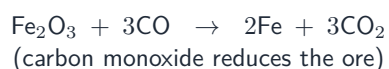
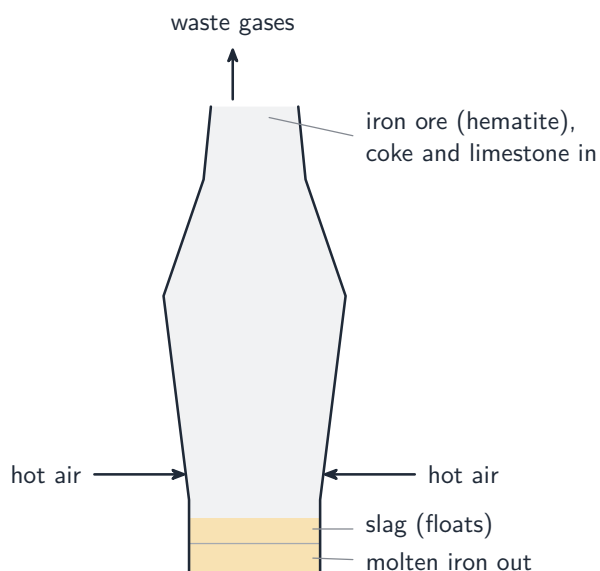
Build the skills to answer exam questions on the **extraction of metals** 金属的提取 — choosing the method, the **blast furnace** 高炉 for iron, and **electrolysis** 电解 for aluminium.

You must be able to:

- link the extraction method to the metal's place in the reactivity series
- describe the reduction of iron oxide in the blast furnace
- describe the extraction of aluminium by electrolysis

1 Worked examples

■ Iron and aluminium



Carbon monoxide reduces iron(III) oxide; limestone removes impurities as slag

most reactive			
	K	potassium	
	Na	sodium	
	Ca	calcium	
	Mg	magnesium	above carbon: extract by electrolysis
	Al	aluminium	
	C	carbon (non-metal)	
	Zn	zinc	
	Fe	iron	below carbon: extract by reduction with carbon
	H	hydrogen (non-metal)	
	Cu	copper	
	Ag	silver	
	Au	gold	
least reactive			

Metals above carbon → electrolysis; metals below carbon → heat with carbon

- **iron:** CO reduces Fe_2O_3 to iron.
- **aluminium:** electrolysis of Al_2O_3 dissolved in molten cryolite.

2 Practice

2.1 State which metal-extraction method is used for metals **above** carbon in the reactivity series. [1]

2.2 Name the ore that iron is extracted from. [1]

3 Exam-style questions

3.1 Aluminium is extracted by electrolysis rather than by heating with carbon because it is: [1]

- **A** less reactive than carbon
 - **B** more reactive than carbon
 - **C** a non-metal
 - **D** a transition metal
-

3.2 Iron is extracted in the blast furnace.

(a) Name the substance that reduces the iron(III) oxide. [1]

(b) State the role of the limestone. [2]

3.3 In the extraction of aluminium, state why cryolite is used and name the product at the cathode. [2]

Solutions

2.1 electrolysis.

2.2 hematite (iron(III) oxide).

3.1 B. Aluminium is more reactive than carbon, so carbon cannot reduce it.

3.2 (a) carbon monoxide.

(b) it decomposes to calcium oxide, which reacts with sandy impurities to form slag.

3.3 cryolite lowers the melting point of the aluminium oxide (saving energy); aluminium forms at the cathode.