

Exercise walk-through

9.6

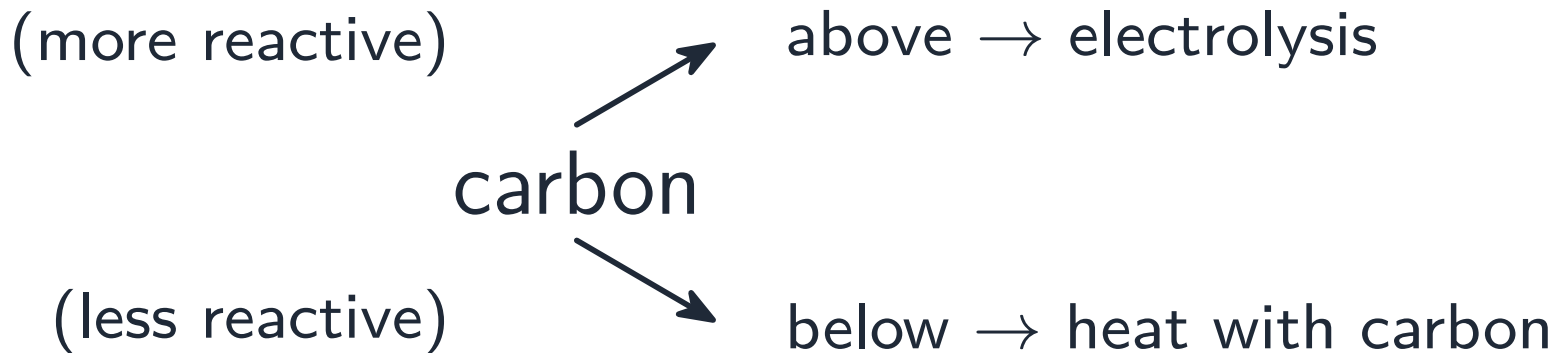
Extraction of metals

IGCSE Chemistry

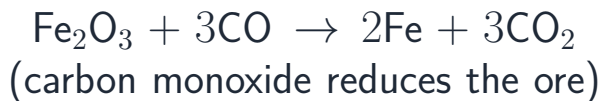
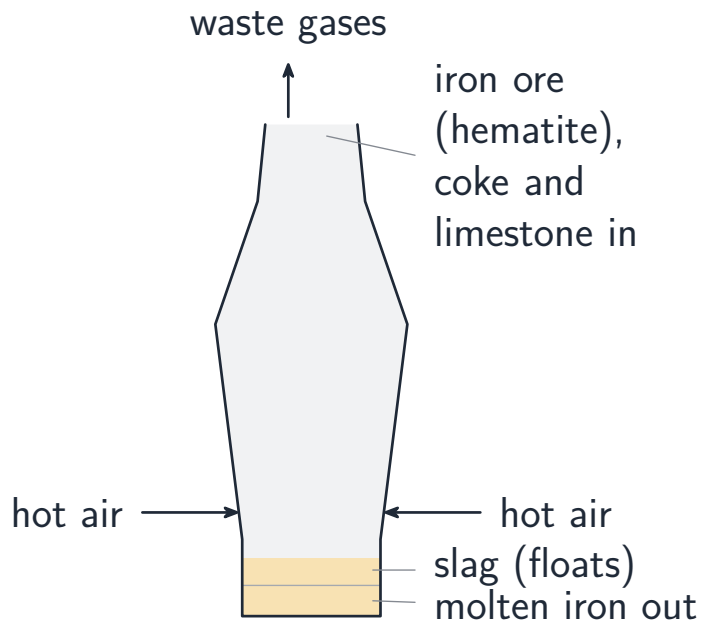
Extraction: reactivity decides

How a metal leaves its **ore** depends on its reactivity:

- above carbon → **electrolysis** (aluminium)
- below carbon → heat with carbon (iron)



The blast furnace



Iron from **hematite** :

- coke burns $\rightarrow \text{CO}_2 \rightarrow$ **carbon monoxide**
- CO **reduces** the iron oxide to iron
- **limestone** removes sandy impurities as **slag**

Chemical properties



Native copper: metals are shiny, dense, malleable conductors of heat and electricity

Corrosion of metals



Corrosion slowly eats away unprotected metal.

Exam tips

- Learn the **reactivity series** (potassium → gold). A more reactive metal displaces a less reactive one from a solution of its ions.
- Metals *above* carbon are extracted by **electrolysis**; those *below* carbon (like iron) can be extracted by heating with carbon.
- **Rusting** needs *both* water and oxygen. Barrier methods (paint, oil) keep them out; **galvanising** also gives sacrificial protection, because the more reactive zinc corrodes instead of the iron.
- **Alloys** are harder than pure metals because the different-sized atoms stop the layers of ions sliding over each other.

Exercises 2.1·2.2

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]

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2.1

- metals **above carbon** are extracted by **electrolysis**
-

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

2.2

- iron is extracted from **hematite** (iron(III) oxide)

Exercise 3.1

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

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3.1 B

- aluminium is **more reactive than carbon**, so carbon cannot reduce it
- A is the opposite; C and D are not the reason

Exercise 3.2 (a)

3.2 Iron is extracted in the blast furnace.

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

[1]

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[1]

(a)

- the reducing agent is **carbon monoxide**

Exercise 3.2 (b)

3.2 Iron is extracted in the blast furnace.

(b) State the role of the limestone.

[2]

Exercise 3.2 (b)

3.2 Iron is extracted in the blast furnace.

(b) State the role of the limestone.

[2]

(b)

- limestone decomposes to **calcium oxide**
- that reacts with sandy impurities to form **slag**

Exercise 3.3

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

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3.3

- cryolite **lowers the melting point** of aluminium oxide (saving energy)
- **aluminium** forms at the cathode