

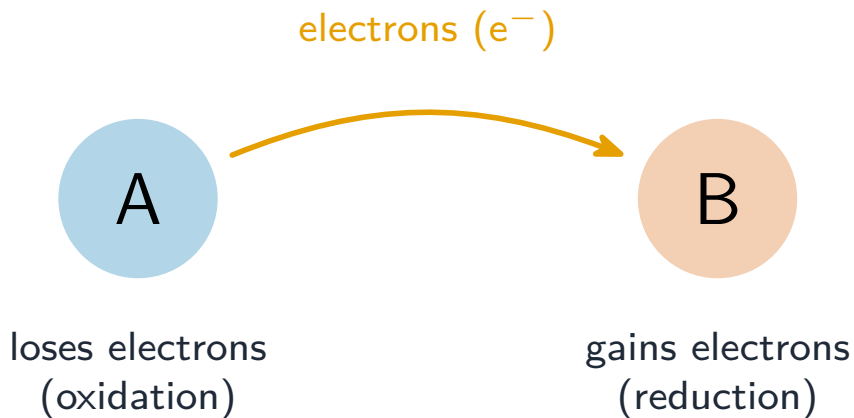
Exercise walk-through

6.4

Redox

IGCSE Chemistry

Redox



**Oxidation
reduction**

&
happen together.

OIL RIG: Oxidation Is
Loss, Reduction Is Gain –
of electrons.

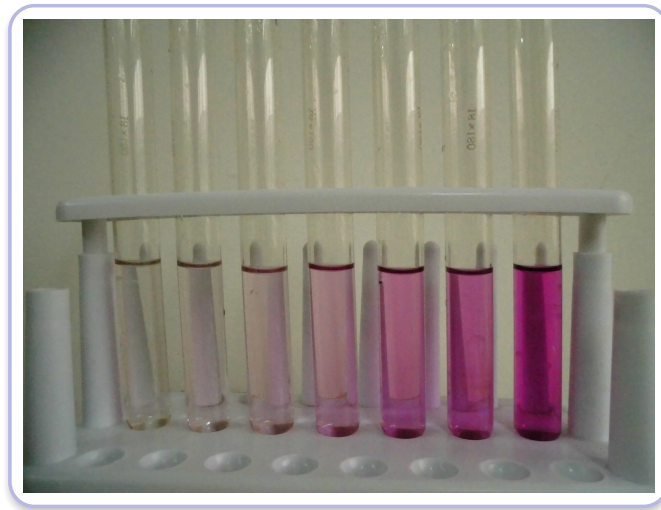
An **oxidising agent** is
itself reduced (purple MnO_4^-
fades).

Oxidation number rules

The oxidation number is shown by a Roman numeral, as in iron(II) and iron(III).

- An element that is not combined has an oxidation number of 0.
- A single-atom ion has an oxidation number equal to its charge (so Na^+ is +1).
- The oxidation numbers in a compound add up to 0.
- The oxidation numbers in an ion add up to the charge on the ion.

Oxidising and reducing agents



Potassium manganate(VII) is deep purple; as it is reduced (or diluted) the purple fades to colourless

A test you can see

The reaction

Chlorine displaces iodine from **potassium iodide** : $\text{Cl}_2 + 2\text{KI} \rightarrow 2\text{KCl} + \text{I}_2$.

What you see

The solution turns brown as **iodine** is released – the more reactive halogen has taken the electrons.

Naming it

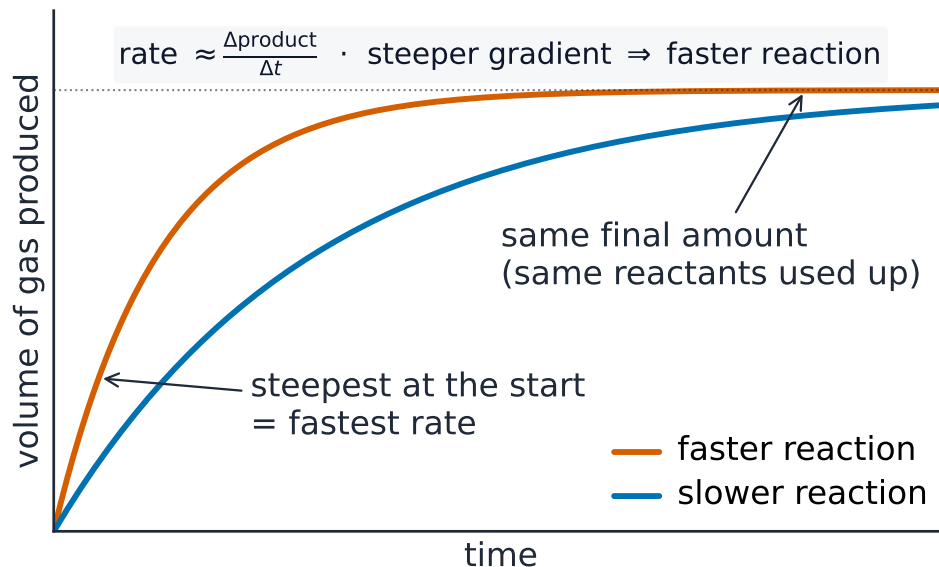
Chlorine is the oxidising agent (it gains electrons and is reduced); iodide is the reducing agent.

Also on the list

Reactions with **oxygen** are the everyday oxidation: burning, rusting, and the tarnishing of a fresh metal surface.

An oxidising agent is the species that is *reduced*. The two words describe the same electron moving.

Measuring the rate, continued



The rate is fastest at the start (steepest) and the line levels off when the reaction finishes

Exercises 2.1·2.2

2.1 Define oxidation in terms of electrons.

[1]

2.2 State the colour change of acidified potassium manganate(VII) when it is reduced.[1]

Exercises 2.1·2.2

2.1 Define oxidation in terms of electrons.

[1]

2.1

- oxidation (electrons) is the **loss of electrons**

2.2 State the colour change of acidified potassium manganate(VII) when it is reduced.[1]

2.2

- acidified potassium manganate(VII) goes **purple to colourless**

Exercise 3.1

3.1 In the reaction $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$, the zinc is:

[1]

☐

A reduced (gains electrons)

B oxidised (loses electrons)

C the oxidising agent

D unchanged

Exercise 3.1

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[1]

☐

A reduced (gains electrons)

B oxidised (loses electrons)

C the oxidising agent

D unchanged

3.1 B

- zinc **loses electrons** to become Zn^{2+} – it is **oxidised**
- A is the copper ion; C is copper(II); D is false

Exercise 3.2 (a)

3.2 Consider $\text{Mg} + \text{CuO} \rightarrow \text{MgO} + \text{Cu}$.

(a) State which substance is oxidised and which is reduced (using oxygen). [2]

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(a) State which substance is oxidised and which is reduced (using oxygen). [2]

(a)

- **magnesium is oxidised** (gains oxygen)
- **copper oxide is reduced** (loses oxygen)

Exercise 3.2 (b)

3.2 Consider $\text{Mg} + \text{CuO} \rightarrow \text{MgO} + \text{Cu}$.

(b) Name the reducing agent.

[1]

Exercise 3.2 (b)

3.2 Consider $\text{Mg} + \text{CuO} \rightarrow \text{MgO} + \text{Cu}$.

(b) Name the reducing agent.

[1]

(b)

- the reducing agent is **magnesium**

Exercise 3.3

3.3 Explain why oxidation and reduction must always happen together in a redox reaction. [2]

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3.3

- electrons lost by one substance must be **gained by another**
- so oxidation and reduction **always happen together**