

Exercise walk-through

4.9

Oxidation-Reduction (Redox) Reactions

AP Chemistry

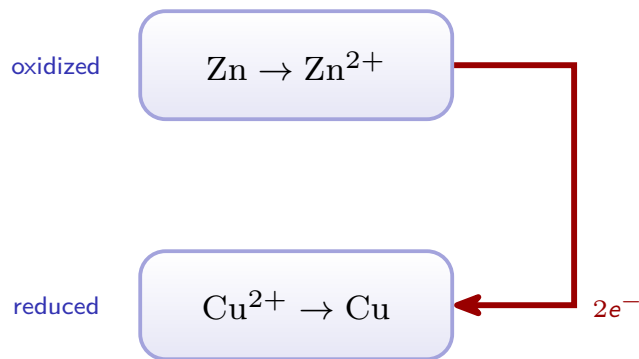
Oxidation-reduction

A **redox** reaction transfers electrons, tracked by **oxidation numbers** :

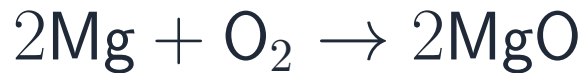
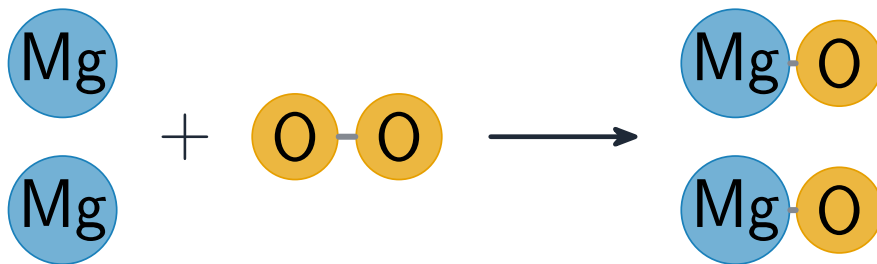
OIL RIG

Oxidation Is Loss, Reduction Is Gain

The **oxidizing agent** is itself reduced; the **reducing agent** is oxidized.



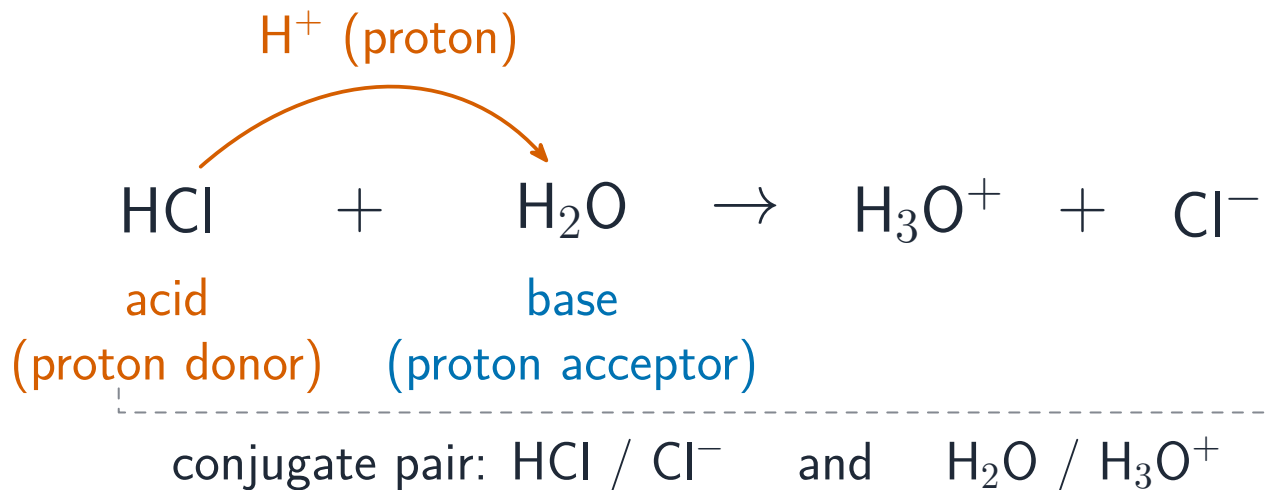
Three Ways to Represent a Reaction



2 Mg and 2 O on each side: balanced

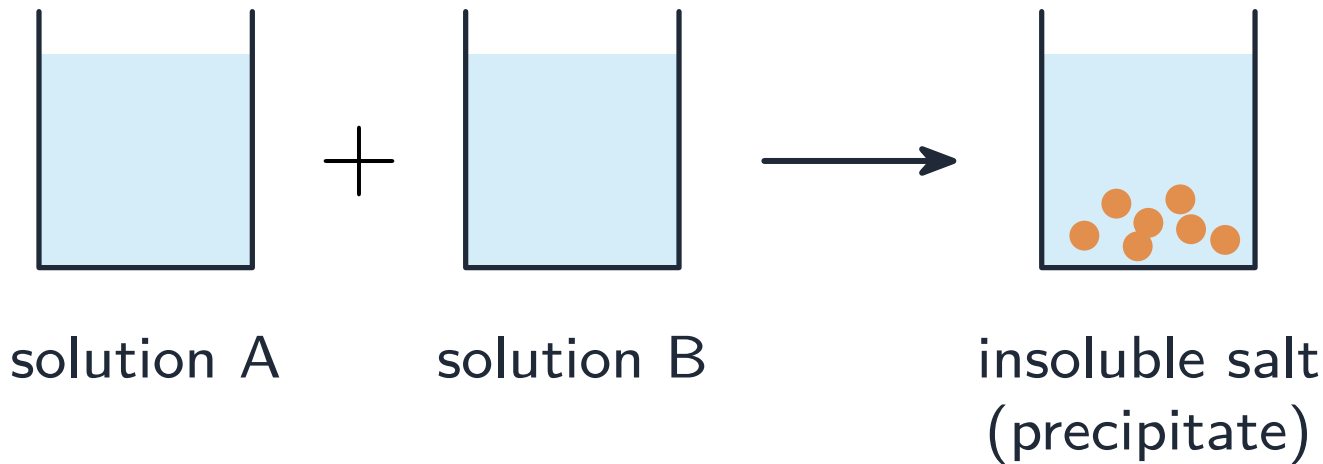
A balanced equation has the same number of each atom on both sides

Acid-Base Reactions, continued



Bronsted-Lowry: an acid donates a proton to a base, forming two conjugate pairs

Net Ionic Equations, continued

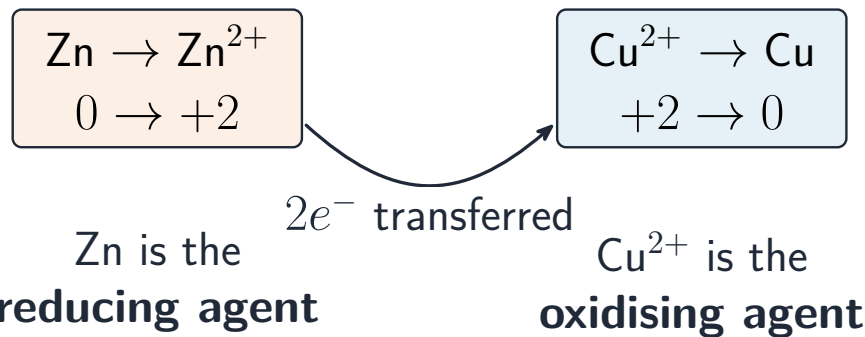


Mixing two solutions can form an insoluble precipitate

Oxidation-Reduction (Redox) Reactions

oxidation: loses $2e^-$
(oxidation number $\uparrow$)

reduction: gains $2e^-$
(oxidation number $\downarrow$)



Redox is electron transfer: the reducing agent is oxidised, the oxidising agent reduced

Exercises 2.1-2.3

2.1 State the oxidation number of an element in its free (uncombined) form. [1]

2.2 Find the oxidation number of S in SO_4^{2-} (O is -2). [2]

2.3 In $\text{Mg} \rightarrow \text{Mg}^{2+} + 2e^-$, is Mg oxidized or reduced? [1]

Exercises 2.1-2.3

2.1 State the oxidation number of an element in its free (uncombined) form. [1]

2.1

- 0
-

2.2 Find the oxidation number of S in SO_4^{2-} (O is -2). [2]

2.2

- $S + 4(-2) = -2 \Rightarrow S = +6$
-

2.3 In $\text{Mg} \rightarrow \text{Mg}^{2+} + 2e^-$, is Mg oxidized or reduced? [1]

2.3

- Oxidized (loses electrons)

Exercise 3.1

3.1 Oxidation is defined as the

[1]

☐

A gain of electrons

B loss of electrons

C gain of protons

D loss of protons

Exercise 3.1

3.1 Oxidation is defined as the

[1]

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A gain of electrons

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3.1 B

- loss of electrons

Exercise 3.2 (a)

3.2 Consider $\text{Fe} + \text{Cu}^{2+} \rightarrow \text{Fe}^{2+} + \text{Cu}$.

(a) State the oxidation number change for Fe and for Cu.

[2]

Exercise 3.2 (a)

3.2 Consider $\text{Fe} + \text{Cu}^{2+} \rightarrow \text{Fe}^{2+} + \text{Cu}$.

(a) State the oxidation number change for Fe and for Cu.

[2]

(a)

- Fe: $0 \rightarrow +2$; Cu: $+2 \rightarrow 0$

Exercise 3.2 (b)

3.2 Consider $\text{Fe} + \text{Cu}^{2+} \rightarrow \text{Fe}^{2+} + \text{Cu}$.

(b) Identify which is oxidized and which is reduced.

[2]

Exercise 3.2 (b)

3.2 Consider $\text{Fe} + \text{Cu}^{2+} \rightarrow \text{Fe}^{2+} + \text{Cu}$.

(b) Identify which is oxidized and which is reduced.

[2]

(b)

- Fe is oxidized; Cu^{2+} is reduced

Exercise 3.3

3.3 For $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$, identify the oxidizing agent and the reducing agent.[3]

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3.3

- Zn is oxidized ($0 \rightarrow +2$), so Zn is the reducing agent; H^+ is reduced ($+1 \rightarrow 0$), so HCl is the oxidizing agent