

CAIE Chemistry IGCSE

6.4 Redox

Flashcards

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Define oxidation number



Define oxidation number

The oxidation number of an element is the charge of an element/ion in a compound which relates to the electrons gained or lost by the element/ion during the formation of the compound.



How can a Roman numeral be used to show the oxidation number of an element?



How a Roman numeral be used to show the oxidation number of an element?

A Roman numeral is put in brackets after the element that needs to have its oxidation number indicated in the name of a compound

E.g. Iron (II) oxide

The (II) shows that the iron ion in the compound has an oxidation number of +2.

E.g. Copper (I) chloride

The (I) shows that the copper ion in the compound has an oxidation number of +1



What is a redox reaction?



What is a redox reaction?

Redox reactions are reactions where both oxidation and reduction take place simultaneously



Define oxidation and reduction in terms
of loss and gain of oxygen



Define oxidation and reduction in terms of loss and gain of oxygen

Oxidation is the gain of oxygen

Reduction is the loss of oxygen



Identify what has been oxidised and reduced in the following reaction, using the loss and gain of oxygen



Identify what has been oxidised and reduced in the following reaction:



The hydrogen has gained oxygen so has been oxidised

The zinc has lost oxygen so has been reduced



Define oxidation and reduction in terms of loss and gain of electrons (extended only)



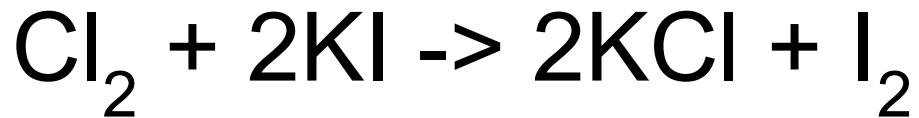
Define oxidation and reduction in terms of loss and gain of oxygen (**extended only**)

Oxidation is the loss of electrons, increasing its oxidation number.

Reduction is the gain of electrons, decreasing its oxidation number



Identify what has been oxidised and reduced in the following reaction, using the loss and gain of electrons



(extended only)



Identify what has been oxidised and reduced in the following reaction: (extended only)



Half equations:

$\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$ Chlorine has gained electrons
(reduced)

$2\text{I}^- \rightarrow \text{I}_2 + 2\text{e}^-$ Iodide ions have lost electrons
(oxidised)



What is the oxidation number of
elements in their uncombined state?
(extended only)



What is the oxidation number of elements in their uncombined state? (extended only)

Zero

E.g. The oxidation number of Zn is 0



What is the oxidation number of a monatomic ion? (extended only)



What is the oxidation number of a monatomic ion?
(extended only)

The same as the charge of the ion

E.g. The oxidation number of Zn^{+2} is +2



What is the sum of oxidation numbers in
a compound? (extended only)



What is the oxidation number of elements in their uncombined state? (extended only)

Zero

E.g. The oxidation number of ZnCl_2 is 0

The oxidation number of Zn^{+2} is +2 and the oxidation number of Cl^- is -1 so:

$$\begin{array}{c} \text{ZnCl}_2 \\ (+2) + 2(-1) = 0 \end{array}$$



What is the sum of oxidation numbers in
an ion (extended only)



What is the sum of oxidation numbers in an ion?
(extended only)

The same as the charge of the ion

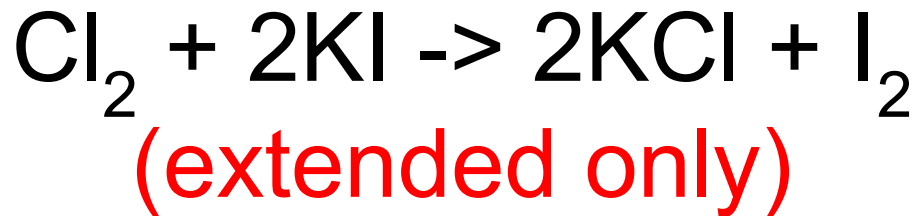
E.g. The oxidation number of SO_4^{-2} is -2

The oxidation number of S is +6 and the oxidation number of O is -2 so:

$$\begin{array}{c} \text{SO}_4^{-2} \\ (+6) + 4(-2) = -2 \end{array}$$



Identify which species has been oxidised and reduced in the following redox equation using their oxidation numbers:

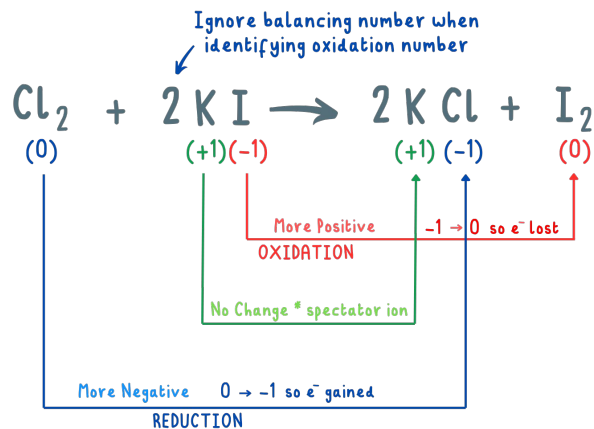


Identify which species has been oxidised and reduced in the following redox equation using their oxidation numbers: **(extended only)**



Chlorine has been reduced from 0 in Cl_2 to -1 in KCl (Cl^- ions)

Iodide ions have been oxidised from -1 in KI to 0 in I_2



How can acidified aqueous potassium
manganate(VII) be used to identify redox
reactions?
(extended only)



How can acidified aqueous potassium manganate(VII) be used to identify redox reactions?
(extended only)

Redox reactions have a reducing and oxidising agent, Potassium manganate(VII) can be used to detect the presence of a reducing agent:

If the Mn^{7+} ions are reduced to Mn^{2+} ions by a reducing agent, a colour change is visible:

Purple \rightarrow colourless.



How can aqueous potassium iodide be
used to identify redox reactions?
(extended only)



How can aqueous potassium iodide be used to identify redox reactions? (extended only)

Redox reactions have a reducing and oxidising agent, Potassium iodide can be used to detect the presence of a oxidising agent:

If the I^- ions are oxidised to I_2 by an oxidising agent, a colour change is visible:

Colourless -> brown



Define an oxidising agent
(extended only)



Define an oxidising agent (extended only)

An oxidising agent is a species which brings about oxidation by gaining electrons from other elements/ions. The oxidising agent is itself reduced.



Define a reducing agent
(extended only)

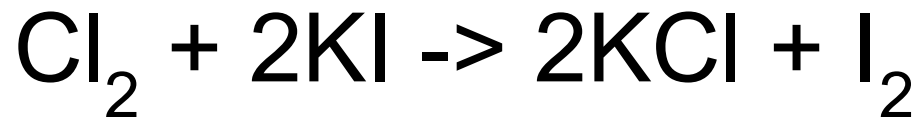


Define a reducing agent (**extended only**)

A reducing agent is a species which brings about reduction by losing (donating) electrons to other elements/ions. The reducing agent is itself oxidised.



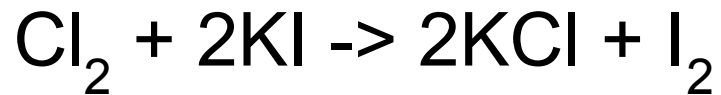
Identify the oxidising and reducing agents in the following reaction:



(extended only)



Identify the oxidising and reducing agents in the following reaction: (extended only)



Half equation: $2\text{I}^- \rightarrow \text{I}_2 + 2\text{e}^-$

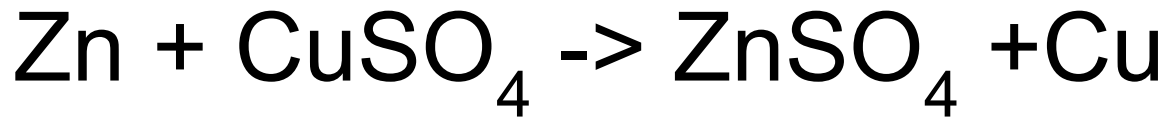
Iodide ions have lost electrons to chlorine and is oxidised itself = iodide ions are the reducing agent

Half equation: $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$

Chlorine has gained electrons from the iodide ions and is reduced itself = chlorine is the oxidising agent.



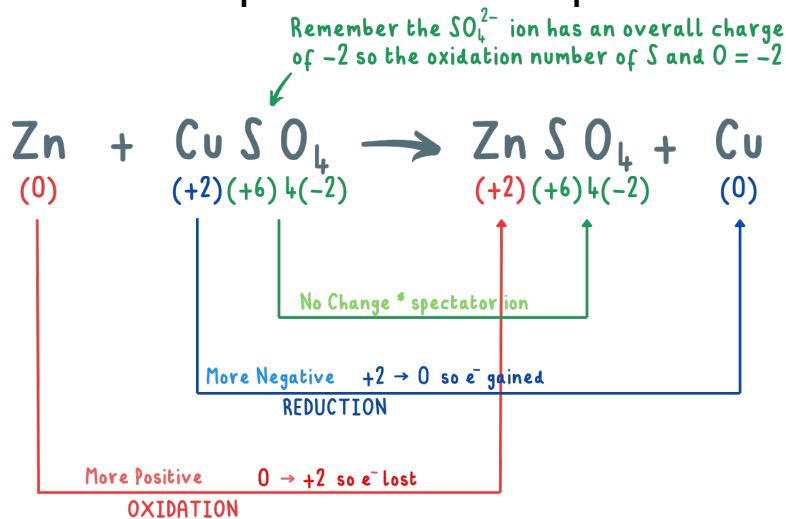
Identify the oxidising and reducing agents in the following reaction, using oxidation numbers :



(extended only)



Identify the oxidising and reducing agents in the following reaction, using oxidation numbers :



Zinc has become oxidised from 0 in Zn to +2 in ZnSO_4 , losing electrons. Zinc is the reducing agent

Copper ions have become reduced from +2 in CuSO_4 to 0 in Cu, gaining electrons.

Copper ions are the oxidising agent

