

Redox

How to construct redox equations

Reduction: Is the _____ of electrons.

Oxidation: Is the _____ of electrons.

Redox equation: A reaction where _____ and _____ takes place.

Constructing redox equations using oxidation numbers

Some questions in the exam involve constructing a balanced equation given a minimal amount of detail. There is a set pattern on how to work these out:

1. Split into two _____ and balance the _____ apart from _____ .
2. Balance the _____ adding water.
3. Balance the _____ by adding _____ ions.
When in _____ conditions
Or
Balance the _____ by adding _____ ions. When in _____ conditions.

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4. Balance the _____ on both sides by adding _____.
5. Combine the two half equations by making sure the _____ balance in each half equation.
6. Cancel out any _____ and _____ that appear on both sides.
7. Check to make sure both sides of the equation have the _____ charge.

E.g.

Chlorine gas oxidises iron(II) ions to iron(III) ions. In the process, the chlorine is reduced to chloride ions.

Use the steps to complete the answer

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A more complicated example:

Manganate(VII) ions, MnO_4^- , oxidises hydrogen peroxide, H_2O_2 , to oxygen gas. The reaction is done with acidified potassium manganate(VII) solution and hydrogen peroxide solution acidified with dilute sulphuric acid.

During the reaction, the manganate(VII) ions are reduced to manganese(II) ions.

Start with the hydrogen peroxide half equation. We can now use steps one to four to balance this half equation:

Complete for the manganate(VII) half equation:

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Combine the two half equations:

An example using alkaline conditions

Iron(II) hydroxide is oxidised to Iron(III) hydroxide by the oxygen in the air.
Construct an overall equation for this reaction.

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Complete the redox equation from the given information:

Potassium dichromate(VI) solution acidified with dilute sulphuric acid is used to oxidise ethanol, $\text{CH}_3\text{CH}_2\text{OH}$, to ethanoic acid, CH_3COOH .

The oxidising agent is the dichromate(VI) ion, $\text{Cr}_2\text{O}_7^{2-}$. This is reduced to chromium(III) ions, Cr^{3+} .

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