



Oxidation

- Magnesium burning!
- $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$
- Can you balance the above equation?
- Rusting of Iron

Reduction

- Extracting metals from their ores
- Copper oxide + hydrogen gas \rightarrow
- Pure copper + water
- $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$

Redox reactions

■ Oxidation

- addition of oxygen, electron loss, increase in oxidation number

■ Reduction

- removal of oxygen, electron gain, decrease in oxidation number

■ Reduction-oxidation (Redox) reaction

- $\text{Mg(s)} + \text{Cu}^{2+}(\text{aq}) \longrightarrow \text{Mg}^{2+}(\text{aq}) + \text{Cu}$
- Mg undergoes oxidation, Cu undergoes reduction in the same reaction - redox

20

Oxidizing and reducing agents

- Oxidizing agents : species causing oxidation
- Reducing agents : species causing reduction
- $2 \text{H}_2\text{S}(\text{g}) + \text{SO}_2(\text{g}) \longrightarrow 3 \text{S}(\text{s}) + 2 \text{H}_2\text{O}(\text{l})$
 - Reducing agent = H_2S
 - Oxidizing agent = SO_2
- $\text{CuSO}_4(\text{aq}) + \text{Zn}(\text{s}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}(\text{s})$
 - Reducing agent = Zn
 - Oxidizing agent = CuSO_4

Oxidising and reducing agents

- The substance that takes electrons is the oxidising agent.
- The oxidising agent is always reduced.
- The substance that gives electrons away is the reducing agent.
- The reducing agent is always oxidised.

Rules for assigning oxidation numbers

Oxidation numbers are simply numbers that are assigned to atoms to help us decide how much they are oxidized/reduced.

Oxidation numbers are not actual charges. Try and write these numbers below the element.

Rule	Description
	http://www.youtube.com/watch?v=1VMc9hBT5Fs
1	The ON of any non-bonded element is 0
2	The ON of an ion of an element is the same as the charge on that ion.
3	Sum of ONs of all elements in a compound is 0
4	<p>Oxygen is usually -2.</p> <p>Exceptions: H_2O_2 ON of oxygen is -1</p> <p style="padding-left: 150px;">OF_2 ON of oxygen is +2</p>
5	<p>Hydrogen usually has an ON of +1</p> <p>Exceptions: When bonded to a less electronegative metal. i.e. a metal</p> <p>Na_+1H_-1</p>
6	<p>Halogens usually have ON of -1.</p> <p>Exceptions: When bonded to a more electronegative element.</p>
7	The sum of all of the oxidation numbers in a complex ion must add up to the charge on that ion.

Balancing Redox equations

- Assign oxidation numbers to each element.
- Identify the element oxidised and reduced
- Balance the elements that are involved in the redox reaction
- Balance remaining elements
- Tip, leave balancing hydrogens until last