

REDOX REACTIONS : OXIDATION + REDUCTION

Note:

The following content was in syllabus till 2016. It is no longer included in the current AS Chemistry syllabus.

- Electrolytes with:

- Copper, Bauxite Al_2O_3 , Brine (conc. NaCl)

Definitions:

Oxidation

- Is the addition of oxygen
- Is the removal of hydrogen
- Is the loss of electrons (OIL)
- Is the increase in oxidation state

Reduction

- Is the removal of oxygen
- Is the addition of hydrogen
- Is the gain of electrons (RIG)
- Is the decrease in oxidation state

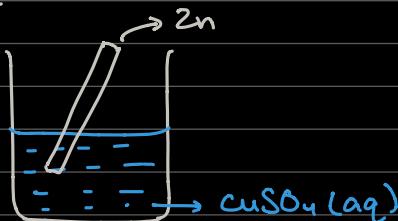
Oxidising Agent: (OA) is a substance that gets reduced itself

- It oxidises another substance by accepting electrons from that substance

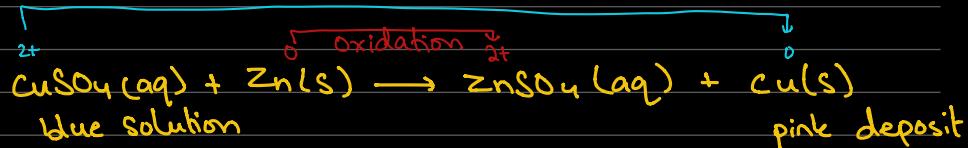
Reducing Agent: (RA) is a substance that gets oxidised itself

- It donates electrons to the oxidising agent

Example

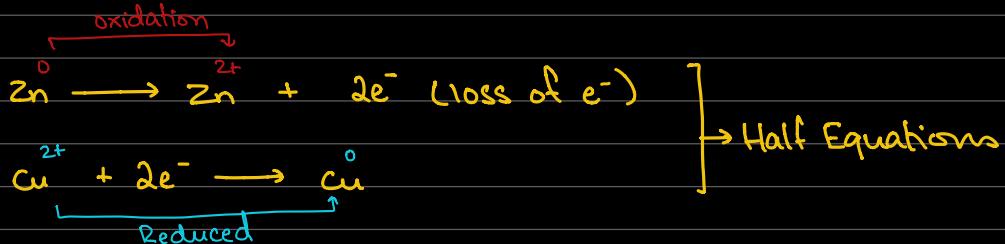


Reduction



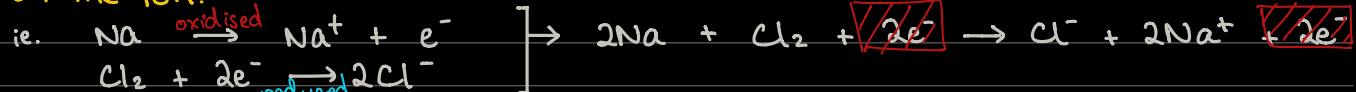
Observations:

- Blue color fades and a pink deposit is seen

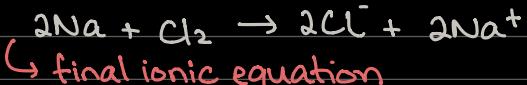


Rules for assigning oxidation numbers:

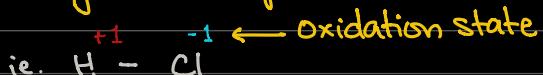
1. All atoms in their elemental state have an oxidation number of 0.
2. In simple ions / ionic compounds, the oxidation number is the same as the charge on the ion.



* Charge on a simple ion is its valency



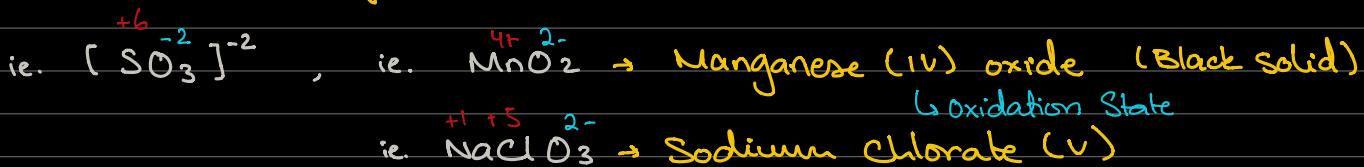
3. In covalent compounds, the more electronegative atom gains the electron and gets the negative charge *No actual transfer, they're still sharing electrons.



4. Covalent or ionic compound → the sum of their individual oxidation states should add up to 0, as long as the compound is neutral



5. In polyatomic ions, the sum of the individual oxidation states is equal to the overall charge.



Exceptions: (to oxidation no.)

- ## 1. Oxygen (Group 6)

- Most common oxidation is -2

- Oxygen is always -2 except in peroxides, ie. H_2O_2 , where it is -1.

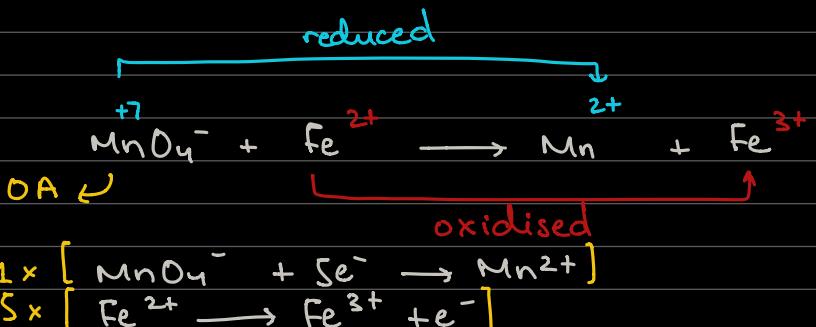
- ## 2. Hydrogen

- Is always +1 except in metal hydrides, where its -1.



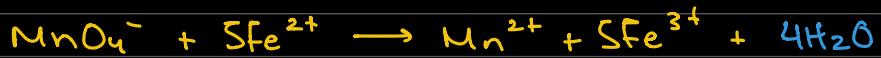
- ### 3. Oxygen (Second exception)

-OF_2 → Fluorine is more electronegative, so it gets the minus charge





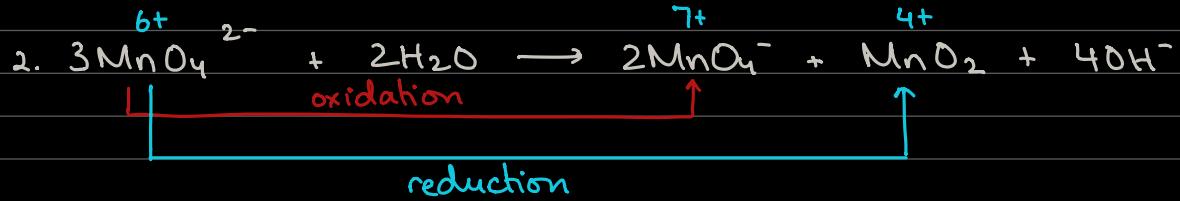
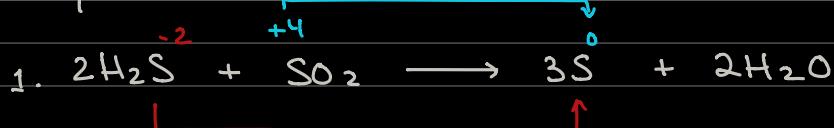
To balance the oxygen, add H_2O to the side where there is no / less oxygen.



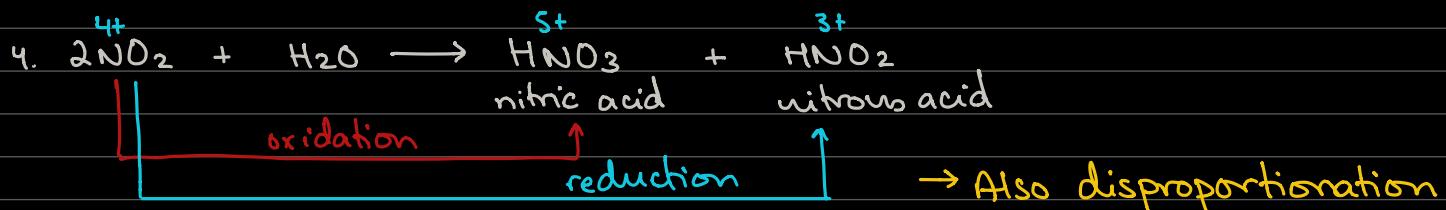
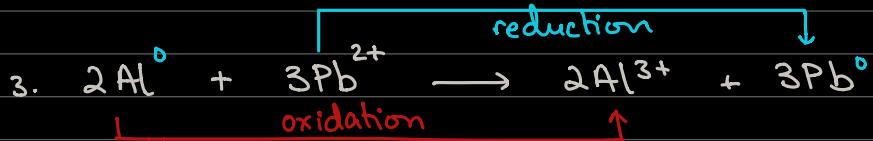
To balance the hydrogen, add H^+ from to the other side / where there are no hydrogens



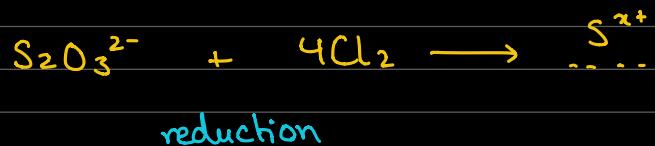
Equations:



↳ Special case of Redox known as "Disproportionation"
- the same species is both oxidized and reduced



Ex. q: An aqueous solution has 1 mol of $\text{S}_2\text{O}_3^{2-}$ (thiosulfate) ions and this reduces 4 mols of Cl_2 to chloride ion. what is the sulfur containing product of this reaction / what is the new oxidation state of sulfur.





$8e^-$ of electrons are gained
 $\therefore 8e^-$ should be lost by $\text{S}_2\text{O}_3^{2-}$



$$+2 + 4 = 6^+$$

Q. Balance the following equations using oxidation numbers.

