♥ Redox reaction ♥

Oxidation: is gain of oxygen, loss of electrons by an atom

Reduction: is loss of oxygen, gain of electrons by an atom.

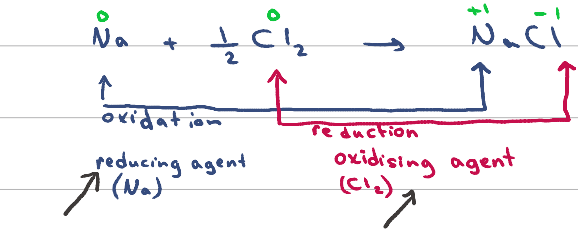
Redox reaction: a reaction in which oxidation and reduction take place at the same time.

OIL RIG

Oxidation is **loss of é** Reduction is **gain of e^-**

Oxidation number ↑ oxidation number ↓

$Na \longrightarrow Na^+ + 1e^-$ $\frac{1}{2}Cl_2 + 1e^- \longrightarrow Cl^-$



species that get oxidised and lose e^- (giving e^-) to another atom or ion

species that get reduced and gain e^- from another atom or ion

Oxidation numbers rules

Gr. 1 : +1

Gr. 2 : +2

Gr. 3 : +3

F : -1

H : +1 with nonmetals

-1 with metals

O : -2 generally

+2 → OF_2

-1 → H_2O_2

find oxidation number of N

$\overset{+1}{H}N\overset{-2}{O}_3$

$+1 + N + (3 \times -2) = 0$

$N - 5 = 0$

$N = +5$

$N\overset{-2}{O}_2$

$N + (2 \times -2) = 0$

$N - 4 = 0$

$N = +4$

$N\overset{-2}{O}_3^{-1}$

$N + (3 \times -2) = -1$

$N - 6 = -1$

$N = +5$

$\overset{+1}{H}Cl\overset{-2}{O}_3$

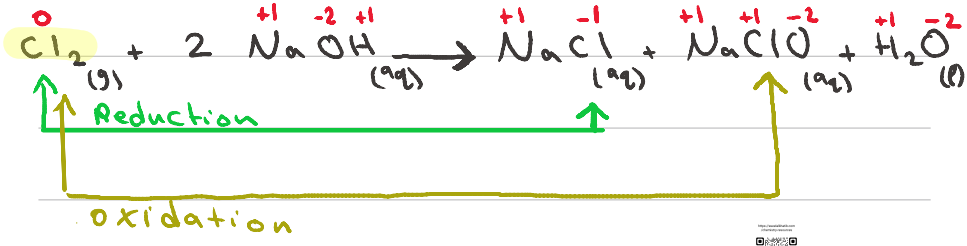
$+1 + Cl + (3 \times -2) = 0$

$Cl - 5 = 0$

$Cl = +5$

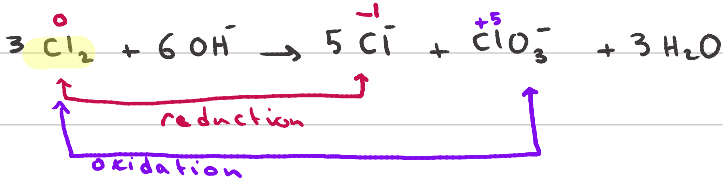
Disproportionation:

the oxidation and reduction of the same species in a chemical reaction



$\overset{0}{Cl_2} \longrightarrow \overset{-1}{Cl^-}$ reduction

$\overset{0}{Cl_2} \longrightarrow \overset{+1}{Cl^+}$ oxidation



Balancing Chemical equations

1. write two half equations
2. balance atoms without oxygen or hydrogen
3. balance oxygen by adding H_2O on the other side
4. balance hydrogen by adding H^+ on the other side
5. balance charge by adding e^- to the more positive side
6. balance electrons by multiplication whole equation
7. add both equations

example: balance : $CuO + NH_3 \rightarrow Cu + N_2$

$(CuO + 2H^+ + 2e^- \rightarrow Cu + H_2O) \times 3$ $\quad 2NH_3 \rightarrow N_2 + 6H^+ + 6e^-$

$3CuO + 6H^+ + 6e^- \rightarrow 3Cu + 3H_2O$ $\quad 2NH_3 \rightarrow N_2 + 6H^+ + 6e^-$

cancel out same species

$3CuO + \cancel{6H^+} + \cancel{6e^-} \rightarrow 3Cu + 3H_2O$

$2NH_3 \rightarrow N_2 + \cancel{6H^+} + \cancel{6e^-}$

$3CuO + 2NH_3 \rightarrow 3Cu + N_2 + 3H_2O$

Balance the following equation

$$MnO_4^- + H_2O_2 \rightarrow Mn^{+2} + O_2$$

$(MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{+2} + 4H_2O) \times 2$ | $(H_2O_2 \rightarrow O_2 + 2H^+ + 2e^-) \times 5$

Charge: +7 | Charge: +2

difference: +5 on more positive side

$$2\,MnO_4^- + 16\,H^+ + 10e^- \rightarrow 2\,Mn^{+2} + 8\,H_2O$$

$$5\,H_2O_2 \rightarrow 5\,O_2 + 10\,H^+ + 10e^-$$

$$2\,MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2\,Mn^{+2} + 5O_2 + 8\,H_2O$$

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always: write half equations without water or H^+, then balance it using the rules

* Remember : compound ions.

NO_3^{-1}	nitrate
NO_2^{-1}	nitrite
SO_4^{-2}	sulfate
SO_3^{-2}	sulfite
PO_4^{-3}	phosphate
PO_3^{-3}	phosphite
NH_4^{+}	ammonium

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you can include oxidation number :

N_2O	nitrogen (I) oxide
NO	nitrogen (II) oxide
NO_2	nitrogen (IV) oxide