

# Recognizing Oxidation-Reduction Reactions

## OXIDATION

## REDUCTION

Oxygen	substance gains O	substance loses O
Halogens	substance gains halogen	substance loses halogen
Electrons	substance loses electrons	substance gains electrons
Oxidation Number	ON increases	ON decreases

## Finding Oxidation Numbers

- 1) For **elements**, ON=0.
- 2) For **monoatomic ions**, ON=**charge on ion**.  
For **alkali metals**, ON=+1; for **alkaline earth metals**, ON=+2.  
For **halogens**, ON=-1 {except when bonded to O}     **F** always -1.
- 3) For **Hydrogen**, ON= +1 with non-metals                    {ON=-1 with only metals.}
- 4) For **Oxygen**, ON=-2    {for **peroxides** (ROOR), ON=-1.}
- 5) For all other atoms, use rule 6.
- 6) **Sum of all oxidation numbers** of atoms in a molecule or ion **equals charge** on molecule or ion.

### Examples

Substance	oxidation numbers			
$\text{H}_2\text{SO}_3$	H = +1	O = -2	S = +4	
$\text{MnO}_4^-$	O = -2	Mn = +7		
$\text{Cl}_2$	Cl = 0			
$\text{Na}_2\text{C}_2\text{O}_4$	Na = +1	O = -2	C = +3	
$\text{Al}^{+3}$	Al = +3			
$\text{Cr}_2\text{O}_7^{2-}$	O = -2	Cr = +6		
$\text{C}_6\text{H}_{12}\text{O}_6$	O = -2	H = +1	C = 0	
$\text{C}_2\text{H}_6$	H = +1	C = -3		
$\text{VO}_2^+$	O = -2	V = +5		
$\text{SO}_4^{2-}$	O = -2	S = +6		
$\text{O}_2$	O = 0			
$(\text{NH}_4)_2\text{CO}_3$	O = -2	H = +1	N = -3	C = +4
$\text{H}_3\text{PO}_4$	O = -2	H = +1	P = +5	
$\text{ClO}_2^-$	O = -2	Cl = +3		