

Electrochemistry (I)

- OIL RIG: "Oxidation Is Loss [of electrons], Reduction Is Gain [of electrons]"
- Oxidation numbers: Accounting device used to keep track of the gain or loss of electrons
- Rules for assigning oxidation numbers to chemical species (in order of application):
 1. The sum of all oxidation numbers of all elements in a species is equal to the net charge of the species:
 - Fe (s)
 - Net Charge = 0
 - N.O = 0
 - Cl⁻ (aq)
 - Net Charge = 1-
 - N. O = -1
 - NaCl (s)
 - Net Charge = 0
 - N. O:
 - Na = +1
 - Cl = -1
 2. When they are not ions or part of a compound, elements have an oxidation number of 0:
 - Br₂ (l)
 - N. O for Br = 0
 - O₂ (g)
 - N. O for O = 0
 - Cu (s)
 - N. O for Cu = 0
 3. When in compounds, group 1 elements have an oxidation number of +1 and group 2 elements have an oxidation number of +2:
 - Li₂S (s)
 - Net Charge = 0
 - N.O:
 - Li = +1
 - S = -2
 - MgO (s)
 - Net Charge: 0
 - N. O:
 - Mg = +2
 - = -2
 4. When in compounds, fluorine has an oxidation number of -1:
 - BF₃ (g)
 - Net Charge = 0
 - N. O:
 - F = -1
 - B = +3

5. When in compounds, hydrogen usually has an oxidation number of +1, with the important exception of metal hydrides:

- $\text{H}_2\text{O} (\text{l})$
 - Net Charge = 0
 - N. O:
 - $\text{H} = +1$
 - $= -2$
- $\text{NH}_4^+ (\text{aq})$
 - Net Charge = 1+
 - N. O:
 - $\text{H} = +1$
 - $\text{N} = -3$
- $\text{NaH} (\text{s})$
 - Net Charge = 0
 - N. O:
 - $\text{Na} = +1$
 - $\text{H} = -1$

6. When in compounds, oxygen usually has an oxidation number of -2, with the important exception of peroxides and superoxides:

- $\text{NO}_3^- (\text{aq})$
 - Net Charge = -1
 - N. O:
 - $= -2$
 - $\text{N} = +5$
- $\text{H}_2\text{O}_2 (\text{l})$
 - Net Charge = 0
 - N. O:
 - $\text{H} = +1$
 - $\text{O} = -1$
- $\text{KO}_2 (\text{s})$
 - Net Charge = 0
 - N. O:
 - $\text{K} = +1$
 - $\text{O} = -1/2$

7. Sometimes we can get fractional oxidation numbers. This is okay.