10/15/2018

Ox State (or #)

- Rules for assigning to each atom:

1. Element = 0 — Na, Cl_2, P_4 (0 0 0)
2. Monatomic ion = charge — Na^+, O^{2-}, Al^{3+} (+1, -2, +3)
3. $\sum_{\text{ea. atom}}$ ox. states = charge — H_2O (x y): $2x+y=0$; NO_3^- (x y): $x+3y=-1$
4. Gp IA: +1, 2A: +2 — $\overset{+1}{Na}Cl$, $\overset{+2}{Ca}F_2$
5. Assign other non-metal elements using the following table:
   - go in priority order.

increasing priority ↑

F	-1
H	+1
O	-2
gp 7A	-1
6A	-2
5A	-3

- Use the rules in order (1-5), and in priority (#5) for all atoms, except last 1.
  - last atom we get using rule #3.

ox #: ±#

charge: #±

example

$\overset{(0)}{Cl_2}$ $\overset{(+1)}{Na^+}$ $\overset{(+1)(-1)}{KF}$ CO_2 (x = +4, y = −2)

$x + 2y = 0$

SO_4^{2-} (x = +6, y = −2)

$x + 4y = -2$

$\Rightarrow x + 4(-2) = -2$

$\Rightarrow x - 8 = -2$

$x = +6$

$\overset{(+1)(-1)}{K_2O_2}$ (x, y)

$2x + 2y = 0$

$2(+1) + 2y = 0$

$2 + 2y = 0$

$\Rightarrow y = -1$

$\overset{(+1)(-1)}{NaH}$

~~$FePO_4$ (x y z; (−3) (−2))~~

~~$x + y + 4z = 0$~~

Forgot that it contains a monatomic ion!!

Fe^{3+} (+3) ; PO_4^{3-} (x, y ← −2)

$x + 4y = -3$

$x + 4(-2) = -3$

$x - 8 = -3$

$x = +5$

$\overset{(+3)(+5)(-2)}{FePO_4}$

Can be fractions!

$x + 2y = 0$

NaO_2 (+1) $(-\frac{1}{2})$

$\Rightarrow +1 + 2y = 0$

$\Rightarrow 2y = -1$

$\Rightarrow y = -1/2$

For you: CH_4 (x = −4, y = +1), $\overset{(+1)(-1)}{H_2O_2}$, $\overset{(+2)(-1)}{SrBr_2}$

$x + 4y = 0$

x Pb^{2+} (+2) SO_4^{2-} (+6) (−2) $PbSO_4$ — think of the ions! , SO_3^{2-} (+4) (−2)

x lead(II) sulfate

$x + 3(-2) = -2$

$x - 6 = -2$

$x = +4$

Identifying Redox rxns

ex: $\overset{(0)}{C} + \overset{(0)}{S_2} \longrightarrow \overset{(+4)(-2)}{CS_2}$ is it redox? YES!

C: oxidized (lost e⁻s)

S_2: reduced (gained e⁻s)

C was oxidized (by S_2, the oxidizing agent)

S_2 was reduced (by C, the reducing agent)

ex: $\overset{(0)}{Mg} + 2\overset{(+1)(-2)}{H_2O} \longrightarrow \overset{(+2)\ (-2)/(+1)}{Mg(OH)_2} + \overset{(0)}{H_2}$

$(+2) + 2\times(O) + 2\times(H) = 0$

$(+2) + 2\times(O) + 2\times(+1) = 0$

$2 + 2x + 2 = 0$

$4 + 2x = 0$

$\Rightarrow x = -2$

$\overset{x}{O}\overset{(+1)}{H}^-$

$x + (+1) = -1$

$x = -2$

Mg was oxidized (by H_2O, the ox. agent)

H_2O was reduced (by Mg, the red. agent).