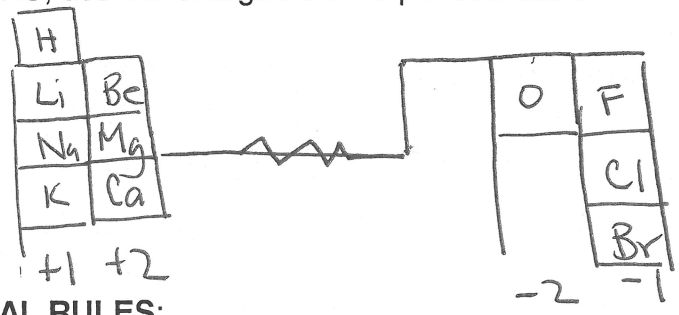
Name: Key
Blk:_____ Date:_____

Chemistry 12
Electrochemistry Lesson #2
OXIDATION NUMBERS!!!

An OXIDATION NUMBER is the charge that an atom "would" possess if it were made up of IONS.

THIS IS A "FICTIOUS CONCEPT" , however, a **useful idea**.

The following ASSUMPTIONS can be made when assigning OXIDATION NUMBERS, use the charges on the periodic table:



GENERAL RULES:

1. Pure elements (ex $Na_{(s)}$, $Br_{2(\ell)}$, $S_{8(s)}$) have an ON of 0
2. The ON of a monatomic ion is equal to its charge.
   ex: $Zn^{2+} = +2$ // $Se^{2-} = -2$
3. Usually H = +1 / Oxygen = -2 (though there are exceptions
4. metal hydrides H = -1 // in peroxides O = -1

The sum of the ON = the charge on the species in Question

Example 1: What is the oxidation number of **P** in the molecule $H_4P_2O_7$?

$4(H) + 2(P) + 7(O) = 0$

$4(+1) + 2(x) + 7(-2) = 0$

$4 + 2x - 14 = 0$

$\frac{2x}{2} = \frac{10}{2}$

$\boxed{x = +5}$

Example 2: What is the oxidation number of **P** in P_4?

$4(P) = 0$

$4(x) = 0$

$\boxed{x = 0}$

Example 3: What is the oxidation number of Cr in Cr^{3+} ?

a)

$1(Cr) = +3$

$1x = +3$

$\boxed{1x = +3}$

3b. What is the ON of S in SO_4^{2-}?

$1(S) + 4(O) = -2$

$1(x) + 4(-2) = -2$

$1x - 8 = -2$

$\boxed{1x = +6}$

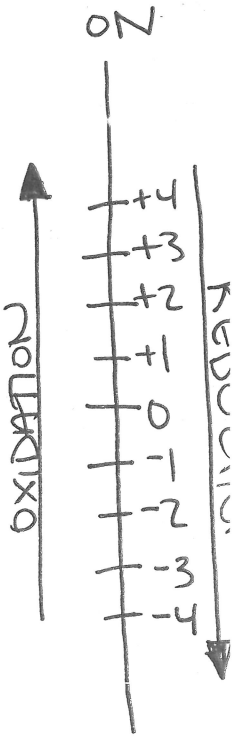
Example 4: What is the oxidation number of Mn in $KMnO_4$?

$1(K) + 1(Mn) + 4(O) = \emptyset$

$1(+1) + 1(x) + 4(-2) = \emptyset$

$1 + x - 8 = \emptyset$

$\boxed{1x = +7}$



TO DETERMINE IF A SUBSTANCE IS UNDERGOING **OXIDATION** OR **REDUCTION** IN A REDOX REACTION:

1. Compare the ON for an element on Reactant + Product side... if the ON INCREASES it has undergone OXIDATION
2. if the ON DECREASES it has undergone REDUCTION

Example 1: Assign an oxidizing number to the bold species and then decide if it is being oxidized or reduced:

a. $\mathbf{ClO_2} + \mathbf{C} \dashrightarrow \mathbf{ClO_2^-} + \mathbf{CO_3^{2-}}$

$*1(Cl) + 2(O) = \emptyset \longrightarrow 1(Cl) + 2(O) = -1$

$1x + 2(-2) = \emptyset \qquad 1x + 2(-2) = -1$

$1x = +4 \longrightarrow 1x = +3 \downarrow \therefore$ REDUCTION of Cl

$C = \emptyset \longrightarrow 1(x) + 3(-2) = -2$

$x = +4 \uparrow \therefore$ OXIDATION of C

b. $\mathbf{CaO} + 2\mathbf{I^-} \dashrightarrow \mathbf{Ca} + \mathbf{I_2}$

$1(Ca) + 1(O) = \emptyset \longrightarrow 1(Ca) = \emptyset$

$1x + 1(-2) = \emptyset \qquad 1x = \emptyset \downarrow \therefore$ REDUCTION of Ca

$x = +2$

FOR HOMEWORK: DO Exercises pg 165 #'s 3-6, PLO's S2 + S3

$2I^- \dashrightarrow I_2$

$2(I) = -2 \qquad 2(I) = \emptyset$

$2(x) = -2 \qquad 2(x) = 0$

$\boxed{x = -1} \longrightarrow \boxed{x = 0} \therefore$ OXIDATION of I

QUICK TRICK
when looking @ oxidation/redu of cmpds containing oxygen.
If # of attached O's ↑ OX
If # of attached O's ↓ RED.