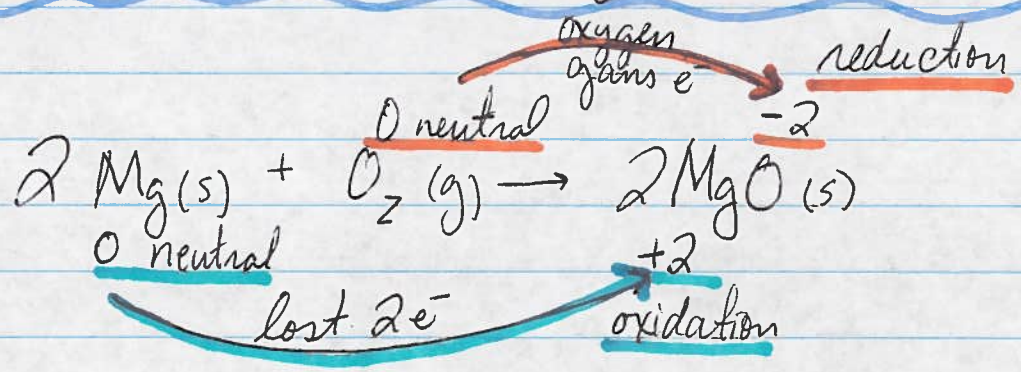
Gen Chem with Doc M

Today: Finish Chp 4 (no 4.12)

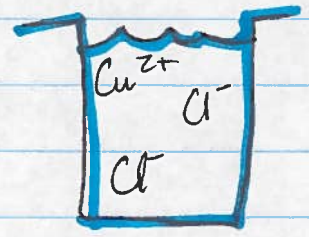
Tuesday: Lab Quiz
Lab 6 → watch 3 youtube videos
meet in HL 244

Wednesday: Start Chp 5
Nomendature Quiz
Thursday: Review @ 7pm, Eppley 110
Friday: Celebration of Knowledge 3!



.013 M $CuCl_2$ (aq)

Cu^{+2} (aq) Cu^{2+} ← Cl^- →



$[Cu^{2+}] \equiv M_{Cu^{2+}} = .013\ M\ Cu^{2+}$

$[Cl^-] \equiv M_{Cl^-} = .026\ \frac{mol\ Cl^-}{L}$

$= .026\ M\ Cl^-$

$Cu^{+2}_{(aq)} + Al_{(s)} \rightarrow Cu_{(s)} + Al^{+3}$

balanced? No! need to conserve e^- (electrons)

$Cu^{+2} \rightarrow Cu_{(s)}$ (2e⁻ reduction)

$Al \rightarrow Al^{3+}$ (3e⁻ oxidation)

Oxidation
Is
Loss

Reduction
Is
Gain

least common multiple of 2+3 is 6

$3\,Cu^{2+}_{(aq)} + 2Al_{(s)} \rightarrow 3Cu_{(s)} + 2Al^{+3}$

(2 × 3e⁻ : Al → Al³⁺; 3 × 2e⁻ : Cu²⁺ → Cu)

Charge		Charge
3	Cu	3
2	Al	2

Assigning Oxidation #'s

1 All neutral (natural) elements have oxidation # of 0.

H_2 Mg Na Cu Al O_2

2 All single atom ions have oxidation # = charge

Na^+ +1 Mg^{+2} +2

Cl^- -1 O^{-2} -2

3. All Group I and Group II s have ox # of +1 and +2 in salts

$LiBH_4$ → Li^+ BH_4^-

MgO_3 → Mg^{+2} O_3^{2-}

4. the Compounds
- H is usually +1
- O is usually -2

- The Σ (sum) of oxidation # = 0 for neutral compounds or = the charge for ionic compounds

HNO_3: +1, $-2 \times 3 = -6$, $N = 5+$

NH_4^+: $+1 \times 4$, $N = -3$

NO_2^-: -2×2, $N = +3$

$(NH_4)_2Cr_2O_7$

$NH_4^+ \times 2$: $-3 + 1$

$Cr_2O_7^{2-}$: $+6 \times 2$, -2×7

gained $6e^-$ reduction

$IO_3^- + 3SO_3^{2-} \rightarrow I^- + 3SO_4^{2-}$

+5 −2(x3) +4 −2(x3) −1 +6 −2(x4)

lost $2e^-$ x3 oxidation

* Halogens are usually −1
  F^- Cl^- Br^- I^-

BUT!

ClO^-	ClO_2	ClO_3	ClO_4
+1 −2	+3 −2	+5 −2	−7 −2

* Iodine in IO_3^- was reduced. * SO_3^{2-} was the reducing reagent.
* Sulfur in SO_3^{2-} was oxidized. * IO_3^- was the oxidizing reagent.

Be specific

4.94 $2KMnO_{4(aq)} + 5H_2C_2O_{4(aq)} + 2H_2SO_{4(aq)} \rightarrow 2MnSO_{4(aq)} + 10CO_{2(g)} + 8H_2O_{(l)} + K_2SO_{4(aq)}$

oxalic acid

K^+ MnO_4^- (+7 −2) (+1 +3 −2) (+1 +6 −2) Mn^{+2} SO_4^{2-} (+4 −2)

$2KMnO_4 \rightarrow 2MnSO_4$ (5e⁻ reduction)

$5H_2C_2O_4 \rightarrow 10CO_2$ (1e⁻ oxidation)

* What volume of .250 M $KMnO_{4(aq)}$ is needed to react with .225g oxalic acid.

$.225\,g\,H_2C_2O_4 \left| \frac{1\,mol\,H_2C_2O_4}{90\,g} \right| = .0025\,mol\,H_2C_2O_4$

$.0025\,mol\,H_2C_2O_4 \left| \frac{2\,mol\,KMnO_4}{5\,mol\,H_2C_2O_4} \right. = .0010\,mol\,KMnO_4$

$\frac{.0010\,mol\,KMnO_4}{.250\,\frac{mol\,KMnO_4}{Liter\ Sol'n}} = .0040\,L = 4.0\,mL$

Folder Activity Chapter 4 Day 4 5 October 2015

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1. Assign oxidation numbers to the nitrogen atom in each of these:

NO_2	NO_2^-	NO_3^-	NH_4^+	N_2O	N_2O_3	HNO_3	KNO_3
$\hookrightarrow -2\times2$	$\hookrightarrow -2\times2$	$\hookrightarrow -2\times3$	$\hookrightarrow +1\times4$	$\hookrightarrow -2$	$\hookrightarrow -2\times3$	H ↓ $\hookrightarrow -2\times3$	+1 ↓ $\hookrightarrow -2\times3$
$N=+4$	$N=+2$	$N=+5$	$N=-3$	$N=+1$	$N_2=+6$ $N=+3$	$N=+5$	$N=+1$

2. Identify the oxidation numbers for each atom in this oxidation-reduction reaction:

lost $2e^-$

$Zn(s) + 2\,HNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + H_2(g)$

0 $+1+5-2$ $+2+5-2$ 0

gain $1e^-$

What was oxidized and by how many electrons? Zn (s) was oxidized by $2e^-$

What was reduced and by how many electrons? H in HNO_3 was reduced by $1e^-$

What is the oxidizing agent? HNO_3 was the oxidizing reagent.

What is the reducing agent? Zn was the reducing reagent

3. Are combustion reactions, such as the one for methane given here, actually oxidation-reduction reactions?

lost $8e^-$

$CH_4(g) + 2\,O_2(g) \rightarrow CO_2(g) + 2\,H_2O(g)$

$-4+1$ 0 $+4-2$ $+1-2$

gain $2e^-$

yes, they are Red Ox reactions

3. Consider the following reaction. What was the $[Fe^{2+}]$ if 46.99 mL 0.2004 M $K_2Cr_2O_7(aq)$ is requied to titrate 50.00 mL of the Fe^{2+} solution?

$$Cr_2O_7^{2-}(aq) + 6\,Fe^{2+}(aq) + 14\,H_3O^+(aq) \rightarrow \bullet\,2\,Cr^{3+}(aq) + \bullet\,6\,Fe^{3+}(aq) + 21\,H_2O(l)$$

$.04699\,\cancel{L} \times \frac{.2004\ mol\ K_2Cr_2O_7}{\cancel{L}} = .00942\ mol\ K_2Cr_2O_7 \left| \frac{1\ mol\ Cr_2O_7^{2-}}{1\ mol\ K_2Cr_2O_7} \right. = .00942\ mol\ Cr_2O_7^{2-}$

$.00942\ mol\ Cr_2O_7^{2-} \left| \frac{6\ mol\ Fe^{2+}}{1\ mol\ Cr_2O_7^{2-}} \right. = .0565\ mol\ Fe^{2+} \Rightarrow \frac{.0565\ mol\ Fe^{2+}}{.05000\,\cancel{L}} = 1.13M\ Fe^{2+}$