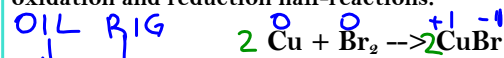Monday, April 13th

<u>Learning Target</u> : I can balance equations to show that mass and charge are conserved.

Homework: Hand in missing work

As you enter... (Write down questions and answers)

Write the oxidation numbers above each element. Then write the oxidation and reduction half-reactions.

OIL RIG

$$2 \overset{0}{Cu} + \overset{0}{Br_2} \rightarrow 2\overset{+1\ -1}{CuBr}$$

Oxidation half-reaction: $2(Cu \rightarrow Cu^{+1} + e^-)$

Reduction half-reaction: $Br_2 + 2e^- \rightarrow 2Br^{-1}$

--Are the # of electrons lost equal to the # gained? No

Reminder: Quiz Wednesday (Vocab, Oxidation #, Half-Reactions)

All assignments for 3rd mkg period due by Friday

Statement of Inquiry: Energy allows for the movement of the parts of a system which is used to manipulate chemical reactions for scientific and technological uses.

AGENDA

<u>8th period:</u>
- Finish Half-Reactions Packet (45 min)

<u>9th period:</u>
- Make up period... You must do the following in order until completion:
- Missing work on progress report
- Electrochem classwork and homework
- HW Extra Credit Assignment
- Exit Tix (5 min)

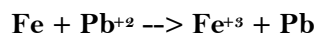And the billboard winner is...

Congratulations

(tree)

Claribel Arroyo!

Tix out the door (Don't forget your name.)

Write the half-reactions for the following reaction. Identify which is oxidation and which is reduction.

$$Fe + Pb^{+2} \rightarrow Fe^{+3} + Pb$$

ELECTROCHEMISTRY: Half-Reactions
Whatever is not finished in class is homework.

1. What is a redox reaction?
   reaction that involves the transfer of e^-

2. Can oxidation occur without reduction? Explain. *OIL RIG*
   No, e^- gain = e^- loss

3. Why would a nail corrode more quickly in saltwater than in distilled water?
   B/c salt turns into ions to allow e^- flow. Na^+ Cl^- Cr_i^{+3}

4. a. What is the oxidation number of any atom in the elemental state? *0*
   b. What is the oxidation number of any monatomic ion? *charge of ion*
   c. What is the sum of the oxidation numbers in a neutral compound equal? *0*
   d. What is the sum of the oxidation numbers in a polyatomic ion equal? *charge of ion*

5. Determine the oxidation number of <u>phosphorous</u> in each substance.
   a. P_2O_5 *-2* +4   c. P_4O_6 *-2* +3   e. PO_3^{3-} +3 OH^-
   b. P *+6, -16* 0   d. H_3PO_4 *-12* +5   f. PO_4^{3-} +5 CrO_4^{2-}
   +3 +5-8 = 0

6. Determine the oxidation numbers of <u>each element</u> in each of the following compounds.
   a. S_2O_3 *S=+3 O=-2*   e. KCl *K=1 Cl=-1* $PO_3^{(3-)}$
   b. Cl_2 *-6 Cl=0*   f. He *He=0* $+3(-2)=-3$
   c. CO_3^{2-} *C=+4 O=-2*   g. NO_2 *N=+4 O=-2* $-6=-3$
   d. NO_3^- *+4 -6 = -2 N=6 O=-2*   h. H_3N *H=+1 N=-3* $x=+3$

7. If a substance is "reduced" does it ~~gain~~ or lose electrons? _____ If a substance is "oxidized" does it gain or ~~lose electrons~~?

8. Distinguish between an oxidizing agent and a reducing agent.   *OIL RIG*
   Oxidizing agent = particle that's reduced
   Reducing agent = Particle that's oxidized

9. Use the changes in oxidation numbers to identify which <u>atom</u> is oxidized and which is reduced. Then, determine which <u>reactant</u> is the oxidizing agent and which is the reducing agent. (Show your work.) You may need to use electronegativity values (p. 405) to determine which atom is gaining or losing electrons, especially for molecular compounds.

   a. H_2 + Cl_2 → 2 HCl

Oxidized / Oxidizing Agent	Reduced / Reducing Agent
H_2 Cl_2	Cl_2 H_2

   b. $2 O_2$ + N_2 → $2 NO_2$ *+4 -2*
   O: ↑ ox #

Oxidized / Oxidizing Agent	Reduced / Reducing Agent
N_2 O_2	N: ↓ ox # O_2 N_2

   c. $2 Li$ + F_2 → $2 LiF$

Oxidized / Oxidizing Agent	Reduced / Reducing Agent

   d. $3 H_2S$ + $2 HNO_3$ → $3 S$ + $2 NO$ + $4 H_2O$
   +1 -2   +1 +5 -2   0   +2 -2   +1 -2

Oxidized / Oxidizing Agent: HNO_3	Reduced / Reducing Agent
H_2S HNO_3	HNO_3 H_2S
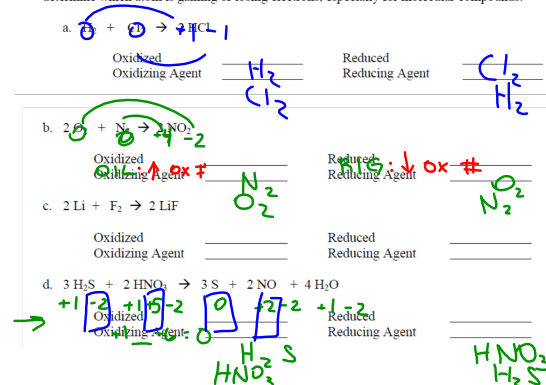
10. Write the oxidation number above each element. Then, determine if each equation represents a redox reaction (circle yes or no).

    a. $2 KClO_3$ → $2 KCl$ + $3 O_2$ yes / no

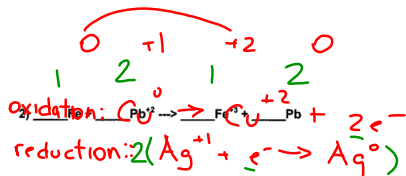   b. $BaCl_2$ + $2 KIO_3$ → $Ba(IO_3)_2$ + $2 KCl$ ~~yes~~ / no
    +1 -6

    c. HCl + $NaOH$ → H_2O + $NaCl$ yes / no
    +1 -1

    d. Mg + Br_2 → $MgBr_2$ yes / no
    +1 -12

    e. NH_4NO_3 → N_2 + H_2O yes / no

C) Balance the following redox reactions by the half-reaction method, rewriting the balanced equations below the given unbalanced equation. Show your work below each reaction and put coefficients in the spaces provided:

1) _____ Cu + _____ Ag^{+1} ---> _____ Cu^{+2} + _____ Ag

   0   +1   +2   0
   1   2   1   2
   Oxidation: Cu^0 → Cu^{+2} + $2e^-$
   reduction: $2(Ag^{+1} + e^- → Ag^0)$

   1. Write all oxidation #
   2. Write half reactions (lost & gain)
   3. Do e^- lost = e^- gain? → Balance.

2) _____ Pb + _____ Fe^{+3} ---> _____ Fe + _____ Pb^{+2} + $2e^-$

3) _____ Ag^{+1} + _____ Cr ---> _____ Ag + _____ Cr^{+3}

4) _____ Ni^{+2} + _____ Li ---> _____ Li^{+1} + _____ Ni

5) _____ Al + _____ H^{+1} ---> _____ Al^{+3} + _____ H$_2$
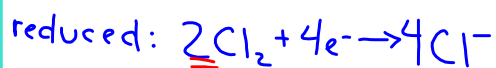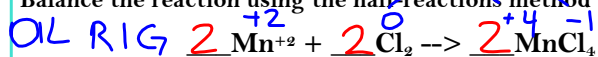
Tuesday, April 14th

Learning Target : I can compare and contrast hydrogen fuel cell vs electric powered vehicles in terms of electrochemistry.

Homework: Hand in missing work

As you enter... (Write down questions and answers)

Balance the reaction using the half reactions method

OIL RIG $\underline{2}$ Mn^{+2} + $\underline{2}$ Cl_2 --> $\underline{2}$ $MnCl_4$

Oxidized: $2(Mn^{+2} \rightarrow Mn^{+4} + 2e^-)$

reduced: $2Cl_2 + 4e^- \rightarrow 4Cl^-$

Reminder: Quiz tomorrow (Vocab, Oxidation #, Half-Reactions)

All assignments for 3rd mkg period due by Friday

Statement of Inquiry: Energy allows for the movement of the parts of a system which is used to manipulate chemical reactions for scientific and technological uses.

AGENDA

9th period:
- Article: Hydrogen Fuel Cell vs Electric Cars (40 min)
- Exit Tix (5 min)

Tix out the door (Don't forget your name.)

Balance the equation by writing out the half-reactions and balancing the charge (# of electrons).
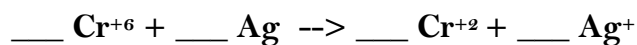
___ Cr^{+6} + ___ Ag --> ___ Cr^{+2} + ___ Ag^+

'Green' Auto Tech Explained

by Tanya Lewis, Staff Writer | January 28, 2015 07:05am ET

Electric cars, like this Tesla Model S, may someday replace internal-combustion-engine vehicles.
Credit: Shal Farley/Flickr, CC BY-SA

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Battery-powered electric cars and hydrogen fuel cell vehicles have both seen advances in their development, and one or both of these technologies ⌞ may represent the future of "green" automobiles.

Both technologies offer a cleaner alternative to internal combustion engines, and both use electric motors powered by electrochemical devices. But what's the difference between them? For one, electric vehicles use energy stored in a battery, whereas fuel cell vehicles have stored fuel that reacts to produce energy.
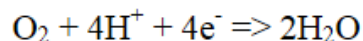
Hydrogen Fuel Cells (with hydrogen and oxygen electrodes)
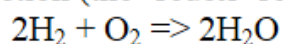
Anode side (an oxidation reaction):
$$2H_2 => 4H^+ + 4e^-$$
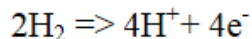
0.0 V

Cathode side (a reduction reaction):
$$O_2 + 4H^+ + 4e^- => 2H_2O$$

+ 1.23 V

Net reaction (the "redox" reaction):
$$2H_2 + O_2 => 2H_2O$$

Total= 1.23 V

Lithium ion battery half cell reactions

$$CoO_2 + Li^+ + e \leftrightarrow LiCoO_2$$
$$E^\circ = 1 \text{ V}$$

$$Li^+ + C_6 + e \leftrightarrow LiC_6$$
$$E^\circ \sim -3 \text{ V}$$

Li metal   Dendrite
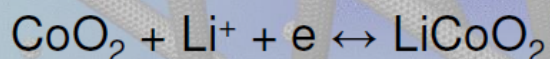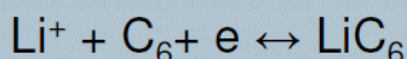
Overall reaction during discharge
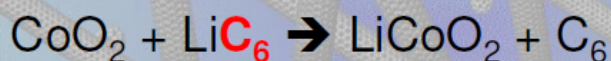
$$CoO_2 + LiC_6 \rightarrow LiCoO_2 + C_6$$
$$E_{oc} = E_+ - E_- = 1 - (-3.01) = 4 \text{ V}$$
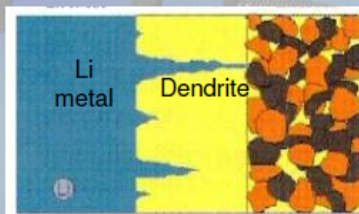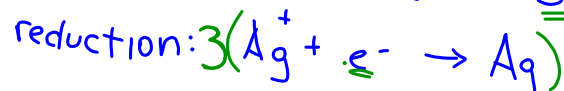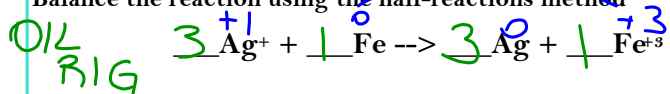
Wednesday, April 15th

Learning Target : I can demonstrate my ability to write half-reactions and balance equations.

Homework: Hand in missing work

As you enter... (Write down questions and answers)

Balance the reaction using the half-reactions method

OIL
RIG

$$3\ Ag^+ + 1\ Fe \rightarrow 3\ Ag + 1\ Fe^{+3}$$

Oxidation: $Fe \rightarrow Fe^{+3} + 3e^-$

reduction: $3(Ag^+ + e^- \rightarrow Ag)$

Reminder: You can retake a quiz. I am after school today and tmw.

All assignments for 3rd mkg period due by Friday

Statement of Inquiry: Energy allows for the movement of the parts of a system which is used to manipulate chemical reactions for scientific and technological uses.

AGENDA

8th period:
- Quiz (30 min)
- HW Extra Credit (15 min)
- [Review Quiz if time permits]

9th period:
- Electrochemical Cell Stations (45 min)
- Exit Tix [5 min]

Tix out the door (Don't forget your name.)

Name 2 differences between a voltaic cell and an electrolytic cell.
(You must talk about both cells in your answer)

Thursday, April 16th

Learning Target : I can demonstrate my ability to write half-reactions and balance equations.

Homework: Hand in missing work

As you enter... (Write down questions and answers)

Using your notes from the stations packet...

1. What is the difference between a voltaic and an electrolytic cell?

· ex) battery
· spontaneous
(runs on its own)

· outside power source needed
non spontaneous

2. In a voltaic cell, which half-reaction occurs at the anode? The cathode?

☆ An Ox

⌐oxidation   ⌐reduction   ☆ Red Cat

Reminder: You can retake a quiz after school or during lunch.

All assignments for 3rd mkg period due tmw

Statement of Inquiry: Energy allows for the movement of the parts of a system which is used to manipulate chemical reactions for scientific and technological uses.

AGENDA

8th period:
- Quiz (30 min)
- HW Extra Credit (15 min)
- [Review Quiz if time permits]

9th period:
- Electrochemical Cell Stations (45 min)
- Exit Tix [5 min]

Tix out the door (Don't forget your name.)

Name 2 differences between a voltaic cell and an electrolytic cell.
(You must talk about both cells in your answer)

Friday, April 17th

🎯 <u>Learning Target</u> : I can test the cell potential of different metals to observe the properties of electrochemical cells.

Homework: Hand in missing work

As you enter... (Write down questions and answers)

Red Cat
An Ox

Which statement describes where the oxidation and reduction half-reactions occur in an operating electrochemical cell?

(1) Oxidation and reduction both occur at the anode.
(2) Oxidation and reduction both occur at the cathode.
(3) Oxidation occurs at the anode, and reduction occurs at the cathode.
(4) Oxidation occurs at the cathode, and reduction occurs at the anode.

Reminder: Electrochemistry Test Tuesday

Statement of Inquiry: Energy allows for the movement of the parts of a system which is used to manipulate chemical reactions for scientific and technological uses.

<u>8th/9th period:</u>
- Finish labeling diagrams (15 min)
- Lab 21: Electrochemical Cells (60 min)
- Debrief Lab (20 min)

Lab notes...

-Correction: Green wire (instead of red) is positive (+) and blue wire (instead of black) is negative (-).

-Do not pour anything down the drain. There are labeled waste beakers.

-Clean up your area and rinse out your electrochemical cells.

Actual values:

Al= 0.6V   Cu= 0.1V   Fe= 0.3V

Pb= 0.4V   Zn=1.0V

Tix out the door (Don't forget your name.)

1. **What information does Table J give you?**
2. **According to Table J, what is the most active metal?**