Monday, April 13th

Learning Target : 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.

lost e-

OIL RIG

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

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

3rd period:

- More & more practice writing half-reactions! (45 min)
- Exit Tix (5 min)

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? electrons gain = e⁻ loss
Reaction that transfers electrons

2. Can oxidation occur without reduction? Explain.
No, electrons gained = e⁻ lost

3. Why would a nail corrode more quickly in saltwater than in distilled water?
Saltwater has ions (Na^+ Cl^-) that allow e⁻'s to flow.

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? Na^+ 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 whole ion

HF: +1 −1 = 0

5. Determine the oxidation number of phosphorous in each substance.

a. P_4O_8 (−2, ×6 −16) +4
b. P 0
c. P_4O_6 (−2, −12) +3
d. H_3PO_4 (+3 +5 −8 = 0) +5
e. PO_3^{3-} (−2) +3
f. PO_4^{3-} (3 −6 = −3) +5 (5 − 8 = −3)

OH^-

6. Determine the oxidation numbers of each element in each of the following compounds.

a. S_2O_3 (−2, −6) S = +3 O = −2
b. Cl_2 0
c. CO_3^{2-} C = 4 O = −2
d. NO_3^- (−2, −6) N = +6 O = −2
e. KCl K = +1 Cl = −1
f. He 0
g. NO_2 N = +4 O = −2
h. H_3N H = +1 N = −3

7. If a substance is "reduced" does it gain or lose electrons? 0 If a substance is "oxidized" does it gain or lose electrons?

OIL RIG

8. Distinguish between an oxidizing agent and a reducing agent.
ox. agent = gains e⁻
red. agent = loses e⁻

9. Use the changes in oxidation numbers to identify which atom is oxidized and which is reduced. Then, determine which reactant 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.

OIL RIG
increases ox # decreases ox #

a. $H_2 + Cl_2 \rightarrow 2\,HCl$ (0 0 +1 −1)

Oxidized H_2 Reduced Cl_2
Oxidizing Agent Cl_2 Reducing Agent H_2

b. $2\,O_2 + N_2 \rightarrow 2\,NO_2$ (0 0 +4 −2)

Oxidized N_2 Reduced O_2
Oxidizing Agent O_2 Reducing Agent N_2

c. $2\,Li + F_2 \rightarrow 2\,LiF$

Oxidized _____ Reduced _____
Oxidizing Agent _____ Reducing Agent _____

d. $3\,H_2S + 2\,HNO_3 \rightarrow 3\,S + 2\,NO + 4\,H_2O$

Oxidized _____ Reduced _____
Oxidizing Agent _____ Reducing Agent _____

10. Write the oxidation number above each element. Then, determine if each equation represents a redox reaction (circle yes or no).

a. $2\,KClO_3 \rightarrow 2\,KCl + 3\,O_2$ yes / no

b. $BaCl_2 + 2\,KIO_3 \rightarrow Ba(IO_3)_2 + 2\,KCl$ yes / no

c. $HCl + NaOH \rightarrow H_2O + NaCl$ yes / no

d. $Mg + Br_2 \rightarrow MgBr_2$ yes / no

e. $NH_4NO_3 \rightarrow N_2 + H_2O$ 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

2) ____Fe + ____Pb^{+2} ---> ____Fe^{+3} + ____Pb

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) OIL RIG

Balance the reaction using the half-reactions method

$$\underline{2}\ Mn^{+2} + \underline{2}\ Cl_2 \rightarrow \underline{2}\ MnCl_4$$

+2 0 +4 -1 -4 = 0

loses e- → ↑ ox #

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

$2Cl_2^0 + 4e^- \rightarrow 4Cl^-$ reduction

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

3rd period:

- Article: Hydrogen Fuel Cell vs Electric Cars (45 min)

4th period:

- Make up period... You must do the following in order until completion:
- Missing work on progress report
- Electrochem classwork and homework
- HW Extra Credit (aka Study sheet for quiz)
- 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^+

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'Green' Auto Tech Explained

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

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Electric cars, like this Tesla Model S, may someday replace internal-combustion-engine vehicles.

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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):

$2H_2 \Rightarrow 4H^+ + 4e^-$ 0.0 V

Cathode side (a reduction reaction):

$O_2 + 4H^+ + 4e^- \Rightarrow 2H_2O$ + 1.23 V

Net reaction (the "redox" reaction):

$2H_2 + O_2 \Rightarrow 2H_2O$ Total= 1.23 V

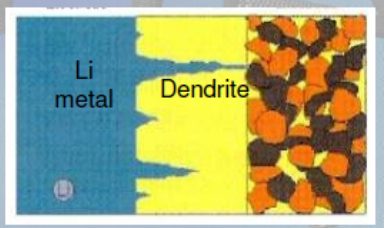
Lithium ion battery half cell reactions

$CoO_2 + Li^+ + e \leftrightarrow LiCoO_2$

$E^o = 1$ V

$Li^+ + C_6 + e \leftrightarrow LiC_6$

$E^o \sim -3$ V



Overall reaction during discharge

$CoO_2 + LiC_6 \rightarrow LiCoO_2 + C_6$

$E_{oc} = E_+ - E_- = 1 - (-3.01) = 4$ V

Wednesday, April 15th

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

Homework: Hand in missing work

Take out Ref. Tables

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

Balance the reaction using the half-reactions method

OIL RIG

$\_3\_Ag^{+1} + \_1\_Fe^{0} \rightarrow \_3\_Ag^{0} + \_1\_Fe^{+3}$

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.

3rd period:

- Quiz (30 min) **LAST GRADE FOR 3RD MKG PER**
- HW Extra Credit (15 min)
- [Review Quiz if time permits]

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

n/a

Thursday, April 16th

Learning Target : 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)

Make two inferences about the properties of electrochemical cells based on the simulation.

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

****All assignments for 3rd mkg period due tomorrow****

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.

3rd/4th period:

- Review Quiz (15 min)
- Lab 21: Electrochemical Cells (60 min)

Lab notes...

-Correction: Green wire is positive (+) and blue wire is negative (-).

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

-Be careful not to cross-contaminate pipettes.

-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?

6) $\overset{0}{Na} + \overset{+1}{H_2}\overset{-2}{O} \rightarrow \overset{+1}{Na}\overset{-2}{O}\overset{+1}{H} + \overset{0}{H_2}$

oxidation: $Na \rightarrow Na^{+1} + 1e^-$

reduction: $2H^{+1} + 2e^- \rightarrow H_2^0$

oxidized = Na

OA = H_2O

reduced = H_2O

RA = Na

Friday, April 17th

Learning Target : I can describe the parts of voltaic and electrolytic cells.

Homework: Hand in missing work

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

Which ion is most easily reduced?

(1) Zn^{2+} (3) Co^{2+}
(2) Mg^{2+} (4) Ca^{2+}

Table J

When a voltaic cell operates, ions move through the

(1) anode (3) salt bridge
(2) cathode (4) external circuit

Reminder: Electrochemistry Exam 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.

3rd period:

- Electrochemical Cells Stations (30 min)
- Voltaic Cells Intro (10 min)
- Exit Tix [5 min]

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

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.