Name

Chemistry

Oxidation Reduction: Drawing and Practice

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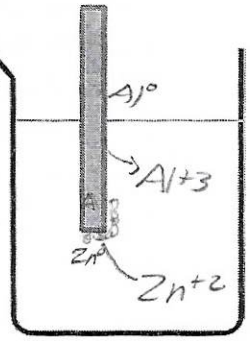
1. Aluminum metal is immersed into an aqueous solution of Zinc nitrate. (label & draw our rxn)

Molecular equation: $2Al + 3Zn(NO_3)_2 \rightarrow 3Zn + 2Al(NO_3)_3$



Half reactions: $Al^0 + Zn^{+2} \rightarrow Zn^0 + Al^{+3}$

$2(Al^0 \rightarrow Al^{+3} + 3e^-)$ +1.66

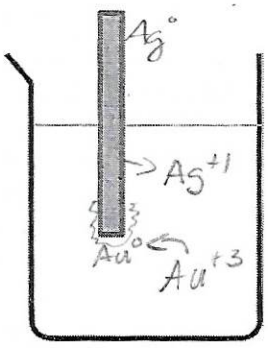
$3(2e^- + Zn^{+2} \rightarrow Zn^0)$ -.76

Balanced $2Al^0 + 3Zn^{+2} \rightarrow 3Zn^0 + 2Al^{+3}$ Voltage: spontaneous?

2. Silver metal is immersed into an aqueous solution of Gold(III) nitrate. (label & draw our rxn)

Molecular equation: $3Ag^0 + Au(NO_3)_3 \rightarrow Au^0 + 3AgNO_3$

$3Ag^0 + Au^{+3} \rightarrow Au + 3Ag^{+1}$



Half reactions: $3Ag^0 \rightarrow 3Ag^{+1} + 3e^-$

$3e^- + Au^{+3} \rightarrow Au^0$ +1.50

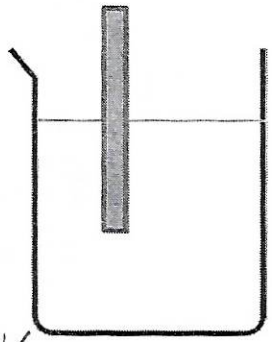
-0.80

Balanced $3Ag^0 + Au^{+3} \rightarrow 3Ag^{+1} + Au^0$ Voltage: +0.70 V spontaneous? yes

3. Creat a reaction that would produce the most voltage possible. (label & draw our rxn)

Molecular equation:

$F_2 + 2Li \rightarrow 2LiF$



Half reactions: $F_2 + 2e^- \rightarrow 2F^{-1}$ +2.87

$Li \rightarrow Li^{+1} + e^-$ +3.05

Balanced $F_2 + 2Li \rightarrow 2LiF$ Voltage: +5.92V spontaneous? yes

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Single Displacement reactions as Oxidation Reduction Reactions

Q: What is really happening during a Single Displacement Reaction?

Molecular equation: $AgNO_{3(aq)} + Cu^{o}_{(s)} \rightarrow Ag_{(s)}^{o} + Cu(NO_3)_2$
Ionic equation: $Ag^{+} + NO_3^{-} + Cu^{o}_{(s)} \rightarrow Ag_{(s)}^{o} + NO_3^{-} + Cu^{2+}_{(aq)}$
Net Ionic equation: $Ag^{+} + Cu^{o}_{(s)} \rightarrow Ag_{(s)}^{o} + Cu^{2+}_{(aq)}$

*** Exchanging electrons***

Oxidation: losing electrons
Reduction: gaining electrons

Half Reactions

$Ag^{+} + Cu^{o}_{(s)} \rightarrow Ag_{(s)}^{o} + Cu^{2+}_{(aq)}$

(Reductions) $Ag^{+}_{(aq)} + 1\,e^{-} \rightarrow Ag_{(s)}^{o}$ (x2)

(Oxidation) $Cu^{o}_{(s)} \rightarrow Cu^{2+}_{(aq)} + 2e^{-}$

$2Ag^{+}_{(aq)} + Cu^{o}_{(s)} + \cancel{2e^{-}} \rightarrow 2Ag_{(s)}^{o} + Cu^{2+}_{(aq)} + \cancel{2e^{-}}$

$2Ag^{+}_{(aq)} + Cu^{o}_{(s)} \rightarrow 2Ag_{(s)}^{o} + Cu^{2+}_{(aq)}$

Answer the following for each question

- Complete the products if reaction is possible.
- Write the Ionic and net ionic form of the reaction
- Separate into half reactions
- Label the number of electrons involved in each half reaction.
- Balance the electrons between half reactions
- Combine the half reactions
- Label each half reaction as either oxidation or reduction

$NaI + F_2 \rightarrow$

Molecular equation: $2NaI + F_2 \rightarrow 2NaF + I_2$
Ionic equation: $2Na^{+} + 2I^{-1} + F_2 \rightarrow 2Na^{+} + 2F^{-} + I_2$
Net Ionic equation: $2I^{-1} + F_2 \rightarrow 2F^{-1} + I_2$

Half Reactions

Reduction half reaction: $2I^{-1} \rightarrow I_2 + 2e^{-}$ $-.53V$
Oxidation half reaction: $2e^{-} + F_2 \rightarrow 2F^{-1}$ $+2.87$

Balance electrons: $2I^{-1} + F_2 \rightarrow I_2 + 2F^{-}$ $+2.34V$

$Ca + NaNO_3 \rightarrow$

Molecular equation: $Ca + 2NaNO_3 \rightarrow Ca(NO_3)_2 + 2Na$
Ionic equation: $Ca^{o} + 2Na^{+} + 2NO_3^{-1} \rightarrow Ca^{+2} + 2NO_3^{-1} + 2Na$
Net Ionic equation: $Ca^{o} + 2Na^{+} \rightarrow Ca^{+2} + 2Na^{o}$

Half Reactions

Reduction half reaction: $Ca^{o} \rightarrow Ca^{+2} + 2e^{-}$ $+2.87$
Oxidation half reaction: $2e^{-} + 2Na^{+1} \rightarrow 2Na^{o}$ -2.71

Balance electrons: $Ca^{o} + 2Na^{+} \rightarrow Ca^{+2} + 2Na$

Combine for overall: $+0.16V$

not spontaneous

$K + Fe_2(SiO_3)_3 \rightarrow$

Molecular equation: $6K^0 + Fe_2(SiO_3)_3 \rightarrow 3K_2SiO_3 + 2Fe$

Ionic equation:

Net Ionic equation: $6K^0 + 2Fe^{+3} + 3SiO_3^{-2} \rightarrow 6K^+ + 3SiO_3^{-2} + 2Fe$

$6K^0 + 2Fe^{+3} \rightarrow 6K^+ + 2Fe^0$

Half Reactions

Reduction half reaction: $6K^0 \rightarrow 6K^{+1} + 6e^-$ +2.92

Oxidation half reaction: $6e^- + 2Fe^{+3} \rightarrow 2Fe^0$ -0.44

Combine for overall: $6K^0 + 2Fe^{+3} \rightarrow 6K^+ + 2Fe^0$ +2.48V spontaneous

$Zn + HCl \rightarrow$

Molecular equation: $Zn^0 + 2HCl \rightarrow H_2 + ZnCl_2$

Ionic equation: $Zn^0 + 2H^+ + 2Cl^{-1} \rightarrow H_2 + Zn^{+2} + 2Cl^{-1}$

Net Ionic equation: $Zn^0 + 2H^+ \rightarrow H_2 + Cl^{-1}$

Half Reactions

Reduction half reaction: $2e^- + 2H^+ \rightarrow H_2$ 0

Oxidation half reaction: $Zn^0 \rightarrow Zn^{+2} + 2e^-$ +.76

Combine for overall: $Zn^0 + 2H^+ \rightarrow Zn^{+2} + H_2$ +0.76V spontaneous

$F_2 + CaBr_2 \rightarrow$

Molecular equation: $F_2 + CaBr_2 \rightarrow CaF_2 + Br_2$

Ionic equation: $F_2 + Ca^{+2} + 2Br^{-1} \rightarrow Ca^{+2} + 2F^{-1} + Br_2$

Net Ionic equation: $F_2 + 2Br^{-1} \rightarrow 2F^{-1} + Br_2$

Half Reactions

Reduction half reaction: $2e^- + F_2 \rightarrow 2F^{-1}$ 2.87

Oxidation half reaction: $2Br^{-1} \rightarrow Br_2 + 2e^-$ -1.07

Combine for overall: $F_2 + 2Br^{-1} \rightarrow Br_2 + 2F^{-1}$ +1.80V spontaneous

$Cu^0 + Cu(NO_3)_2$ (This reaction is possible… think)

Molecular equation: $Cu^0 + Cu(NO_3)_2 \rightarrow CuNO_3$

Ionic equation:

Net Ionic equation: $Cu^0 + Cu^{+2} + 2NO_3^{-1} \rightarrow 2Cu^{+1} + 2NO_3^{-1}$

Half Reactions

Reduction half reaction: $1e^- + Cu^{+2} \rightarrow Cu^{+1}$ 0.15

Oxidation half reaction: $Cu^0 \rightarrow Cu^{+1} + 1e^-$ -0.52

Combine for overall: $Cu^{+2} + Cu^0 \rightarrow 2Cu^{+1}$ -0.37 V not spontaneous

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Chemistry
Oxidation Reduction 1

Del Product

DIRECTIONS:

- Split into half reactions, balance, and write net ionic equation.
- Determine the voltage (If voltage is negative, then indicate No reaction)
- In the original problem circle the spectator ion.
- **Determine the voltage of the reaction**

1. $Al(C_2H_3O_2)_3 + 3Na \rightarrow Al + 3NaC_2H_3O_2$

$3e^- + Al^{+3} \rightleftarrows Al$ -1.66

$Na \rightarrow 3Na^+ + 3e^-$ $+2.71$

$Al^{+3} + Na \rightarrow Al + 3Na^+$ $+1.05\ V$ spontaneous

2. $Sn + 2AgI \rightarrow 2Ag + SnI_2$

$2e^- + 2Ag^{+1} \rightarrow 2Ag^0$ 0.80

$Sn \rightarrow Sn^{+2} + 2e$ -0.15

$2Ag^{+1} + Sn \rightarrow 2Ag^0 + Sn^{+2}$ $+0.65\ V$ spontaneous

3. $FeSiO_3 + 2K \rightarrow Fe + K_2SiO_3$

$2e^- + Fe^{+2} \rightarrow Fe^0$ -0.44

$2K^0 \rightarrow 2K^{+1} + 2e^-$ 2.92

$Fe^{+2} + 2K \rightarrow Fe^0 + 2K^{+1}$ $+2.48\ V$ spont.

4. $3Zn + 2Ni(MnO_4)_3 \rightarrow 2Ni^0 + 3Zn(MnO_4)_2$

$3Zn^0 \rightarrow 3Zn^{+2} + 6e^-$ $+.76\ V$

$6e^- + 2Ni^{+3} \rightarrow 2Ni^0$ -0.25

$3Zn + 2Ni^{+3} \rightarrow 3Zn^{+2} + 2Ni^0$ $+0.51\ V$ spont.

5. $Al_2(CrO_4)_3 + 6Na \rightarrow 2Al^0 + 3Na_2CrO_4$

$6e^- + 2Al^{+3} \rightarrow 2Al^0$ -1.66

$6Na \rightarrow 6Na^+ + 6e^-$ $+2.71$

$+1.05\ V$ spont.

6. $2NaF + I_2 \rightarrow 2NaI + F_2$

$2F^{-1} \rightarrow F_2 + 2e^-$ -2.81

$2e^- + I_2 \rightarrow 2I^{-1}$ 0.53

$-2.28\ V$ non spont.

7. $Au + 3NaCl \rightarrow AuCl_3 + 3Na$

$Au \rightarrow Au^{+3} + 3e^-$ -1.50

$3e^- + 3Na^{+1} \rightarrow 3Na^0$ -2.71

$3Na^{+1} + Au \rightarrow Au^{+3} + 3Na$ $-4.21\ V$ non spont.

Name
Chemistry
Oxidation Reduction Reactions #2

DIRECTIONS:

- Complete only the molecular and net ionic
- Determine the voltage for the reaction

Molecular equation: $Sn_{(s)} + AgI_{(aq)} \rightarrow SnI_{2(aq)} + Ag_{(s)}$
Ionic Equation: $Sn + Ag^{+} + I^{-} \rightarrow Sn^{2+} + I^{-} + Ag$
Net ionic equation: $Sn + Ag^{+} \rightarrow Sn^{2+} + Ag$

1. A strip of zinc is placed in a solution of nickel (II) nitrate.

mol eq: $Zn_{(s)} + Ni(NO_3)_{2(aq)} \rightarrow Zn(NO_3)_{2(aq)} + Ni_{(s)}$ +0.76
ionic: $Zn + Ni^{+2} + 2NO_3^{-1} \rightarrow Zn^{+2} + 2NO_3^{-1} + Ni$ -0.25
net: $Zn + Ni^{+2} \longrightarrow Zn^{+2} + Ni$ +0.51V

2. A strip of lead metal is added to a solution of silver nitrate.

mol eq: $Pb(s) + AgNO_3(aq) \rightarrow Pb(NO_3)_{2(aq)} + Ag(s)$ +0.13
ionic: $Pb + Ag^{+1} + NO_3^{-1} \rightarrow Pb^{+2} + NO_3^{-1} + Ag$ +0.80
net: $Pb + Ag^{+1} \rightarrow Pb^{+2} + Ag$ +0.93V

3. Zinc metal is placed in a solution of copper(II) sulfate

mol eq: $Zn + CuSO_4 \rightarrow Cu + ZnSO_4$
ionic: $Zn^{0} + Cu^{+2} + SO_4^{-2} \rightarrow Cu^{0} + Zn^{+2} + SO_4^{-2}$ +0.34
net: $Zn^{0} + Cu^{+2} \rightarrow Cu^{0} + Zn^{+2}$ +0.76
+1.11V

4. A piece of copper wire is placed in a solution of silver nitrate.

mol eq: $Cu + AgNO_3 \rightarrow Cu(NO_3)_2 + Ag$
ionic: $Cu^{0} + Ag^{+1} + NO_3^{-1} \rightarrow Cu^{+2} + NO_3^{-1} + Ag$ +0.80
net: $Cu^{0} + Ag^{+1} \rightarrow Cu^{+2} + Ag^{0}$ -0.34
+0.46V

5. Fluorine gas is bubbled through a solution of Sodium chloride

m: $F_2 + 2NaCl \rightarrow 2NaF + Cl_2$ +2.87
I: $F_2 + 2Na^{+} + 2Cl^{-} \rightarrow 2Na^{+} + 2F^{-} + Cl_2$ -1.36
NI: $F_2^{0} + 2Cl^{-} \rightarrow 2F^{-} + Cl_2^{0}$ +1.51V

6. Copper nitrate solution is poured on to a silver plate

$2Cu(NO_3)_2 + 2Ag \rightarrow Cu^{0} + 2AgNO_3$
$Cu^{+2} + 2NO_3^{-1} + 2Ag \rightarrow Cu + 2Ag^{+1} + 2NO_3^{-1}$ 0.34
$Cu^{+2} + 2Ag^{0} \not\rightarrow Cu + 2Ag^{+1}$ -0.80
-0.46V