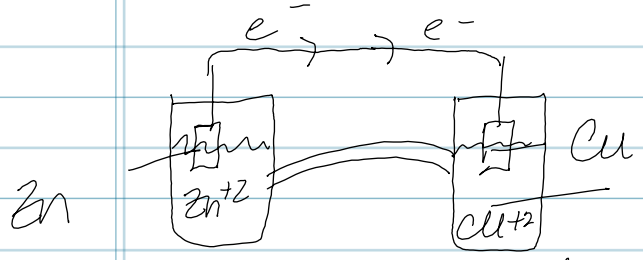
Electrolysis Notes

Galvanic - spontaneous flow of electrons

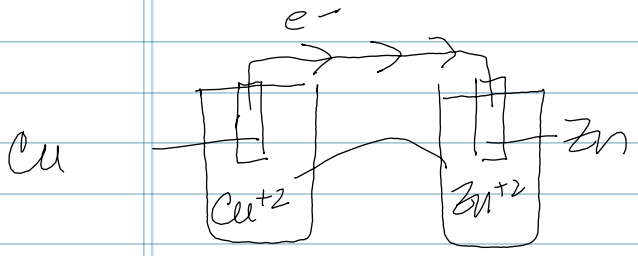


Ecell = positive battery

anode
OX
$Zn^0 \rightarrow Zn^{+2} + 2e^-$

cathode
reduction
$Cu^{+2} + 2e^- \rightarrow Cu^0$

Electrolytic cell - not spontaneous. The electrons flow only because an electrical source pushes them.



Zn, Cu
Zn reduced
Cu oxidized - anode
$Cu \rightarrow Cu^{+2} + 2e^-$
$Zn^{+2} + 2e^- \rightarrow Zn$

anode
OX

cathode
reduction

Ecell = negative needs a battery

Exercise 9

$1\,amp = \frac{1\,coloumb}{1\,sec}$

$5\,amp = \frac{5\,coloumbs}{1\,sec}$

$F = 96,485 \frac{coloumb}{1e^-}$

$\#min = 10.5g\,Ag \times \frac{1mole\,Ag}{108g} \times \frac{1mole\,e^-}{1mole\,Ag} \times \frac{96,485\,col}{1e^-} \times \frac{1sec}{5\,col} \times \frac{1min}{60sec}$

31.26 min

Exercise 10

reduced – oxidizing agent
species with high standard elec. potential
potential

$Ce^{+4} + e^- \rightarrow Ce^{+3}$	1.70V
VO^+	1.00V
Fe^{+3}	.77V

6. Predicting the products of electrolysis

~~$NaCl(s) \Rightarrow Na^+ + Cl_2^-$~~
$NaCl(s) \rightarrow Na^+ + Cl^-$

cation is pawsite
loses an electron
oxidation

anion
gain an electron
reduction

electrolysis
(backwards)

cation
reduced
cathode

anion
oxidized
anode

$NaCl(aq) \rightarrow Na^+ + Cl^-$

H_2O oxidized	$2H_2O \rightarrow O_2 + 4e^- + 4H^+$	$E = -1.23V$
H_2O reduced	$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$	$E = -.83V$

Cathode - species being reduced will have HIGHEST
anode - species being oxidized will have LOWEST

cathode
reduced
a ode

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

H_2O $-.83V$
is cathode

Look it up

xidiz

Electrolepes

0.5M $ZnSO_4$
0.5M $NiSO_4$

$Zn^{+2} + 2e^- \rightarrow Zn$ $\quad E = -.76$
$Ni^{+2} + 2e^- \rightarrow Ni$ $\quad E = -.23$

E_{cell} = negative

red OR

$Zn^{+2} + 2e^- \Rightarrow Zn$ red = $-.76$
$Ni \rightarrow Ni^{+2} + 2e^-$ $\quad +.23$
$\quad -.53\ V$

cathode - reduction

Zn^{+2}	$-.76$	Largest number	Zn^{+2} cathode
H_2O	$-.83$		

anode - oxidation

Ni	$.23\ V$	Lowest number	H_2O anode
H_2O	$-1.23\ V$		

$2(Zn^{+2} + 2e^- \Rightarrow Zn)$ $\quad -.76V$
$2H_2O \rightarrow O_2 + 4H^+ + 4e^-$ $\quad -1.23V$
$\quad E_{cell}$

$$2Zn^{+2} + 2H_2O \rightarrow 2Zn + O_2 + 4H^+$$