20/36c $3Fe^{+2}_{(aq)} \rightarrow Fe^{0}_{(s)} + 2Fe^{+3}_{(aq)}$

OX AND RED

GER $2e^- + Fe^{+2} \rightarrow Fe^0$ E^0_{red} $-0.440v$

$2Fe^{+2} \rightarrow 2Fe^{+3} + 2e^-$ E^0_{ox} $-0.771v$

$1.211v$

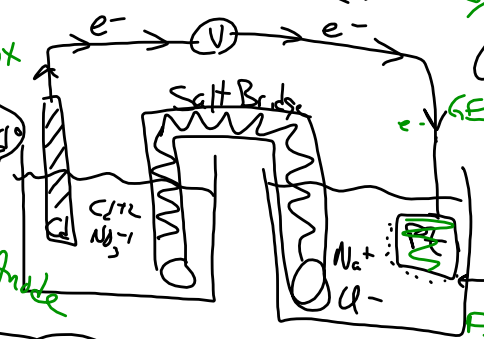
20/40 $Cd_{(s)}$ in $Cd(NO_3)_2$ (aq) } Pt non reactive → GAS

$Cl_{2(g)}$ in $NaCl_{(aq)}$

LEO An ox

$Cd^{+2} + 2e^- \rightarrow Cd^0$ $-0.403v$

Δ to ox



e⁻ GER

$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-$ $+1.359v$ * STAYS

⊖ Anode

FAT RED CAT – Cathode ⊕

GER $Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(aq)}$ $+1.359v$

LEO $Cd^0_{(s)} \rightarrow Cd^{+2}_{(aq)} + 2e^-$ $+0.403v$

lose mass

$Cl_{2(g)} + Cd^0_{(s)} \rightarrow 2Cl^-_{(aq)} + Cd^{+2}_{(aq)}$ $+1.762v$ E^0_{rxn}

Spont!

20.47

STAY as RED must be larger #

Red $Eu^{+3} + e^- \rightarrow Eu^{+2}$ $E^\circ_{red} = -0.43V$

force red of $Eu^{+3} \rightarrow Eu^{+2}$

Other item must undergo OX (E°_{ox})

$E^\circ_{red} < -0.43$ volts *

Al $E^\circ_{red} = -1.66v$ $-1.66 < -0.43$ *

Flip to ox

$Co^{+2} + 2e^- \rightarrow Co$ -0.277 $-0.277 > -0.43$

Exam 2 (16)

0.15 mole HBz
- Benzoic acid
+
0.3 mole NaBz
Buffer

+ 0.5 mole HCl
SA
pH ↓

$NaBz \rightarrow Na^+_{(aq)} + Bz^-$
SA CT
or WA

$Bz^- + HOH \rightarrow HBz + OH^-$
Proton acceptor
BL Base

SHE - Std. hydrogen electrode

E p1117

$E^\circ_{red} = 0$

$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

AT EQ then $\Delta G = 0$ and $Q = K$

$\Delta G^\circ = -RT\ln K$

$\Delta G = \Delta G^\circ + RT\ln Q$

$\Delta G^\circ = -nFE^\circ$

$\Delta G = \Delta G^\circ + RT\ln Q$

$\frac{-nFE}{-nF} = \frac{-nFE^\circ}{-nF} + \frac{RT\ln Q}{-nF}$

$E = E^\circ - \frac{RT}{nF}\ln Q$

non std. std condit.

AT EQ
$Q = K$
$\Delta G = 0$
$E = 0$

$E^\circ = \frac{RT}{nF}\ln K$

E = Volts

Volt = $\frac{J}{coul}$ ← $R = 8.314\,J$

$\Delta G = KJ$ $\Delta G = \Delta G^\circ + RT\ln Q$ ← $8.314\times10^{-3}\,kJ$

$\Delta G^\circ = -nFE^\circ$

J J

WATCH UNITS

Ex $[Cr_2O_7^{-2}] = 2M$, $[H^+] = 1M$ $[I^-] = 1M$

$[Cr^{+3}] = 1 \times 10^{-5} M$

Not E° → Calc E at 298K

$$Cr_2O_7^{-2}{}_{(aq)} + 14H^+_{(aq)} + 6I^-_{(aq)} \rightarrow 2Cr^{+3}_{(aq)} + 3I_{2(s)} + 7H_2O_{(l)}$$

Std condition = 298K AND [1M] ⇒ Not all 1M

$$E = E^\circ - \frac{RT}{nF} \ln Q$$

Ep 1117

$Cr_2O_7^{-2} + 14H^+ + 6e^- \rightarrow 2Cr^{+3} + 7H_2O_{(l)}$ $+1.33V$

$6 \times 2I^- \rightarrow 3I_2 + 6e^-$ $-0.536V$

$E^\circ_{rxn} = +0.794V$

$$Q = \frac{[Cr^{+3}]^2}{[Cr_2O_7^{-2}][H^+]^{14}[I^-]^6} = \frac{(1\times10^{-5})^2}{(2)(1)^{14}(1)^6} = 5\times10^{-10}$$

Q

$Cr_2O_7^{-2} \,|\, Cr^{+3} \,\|\, I^- \,|\, I_2$

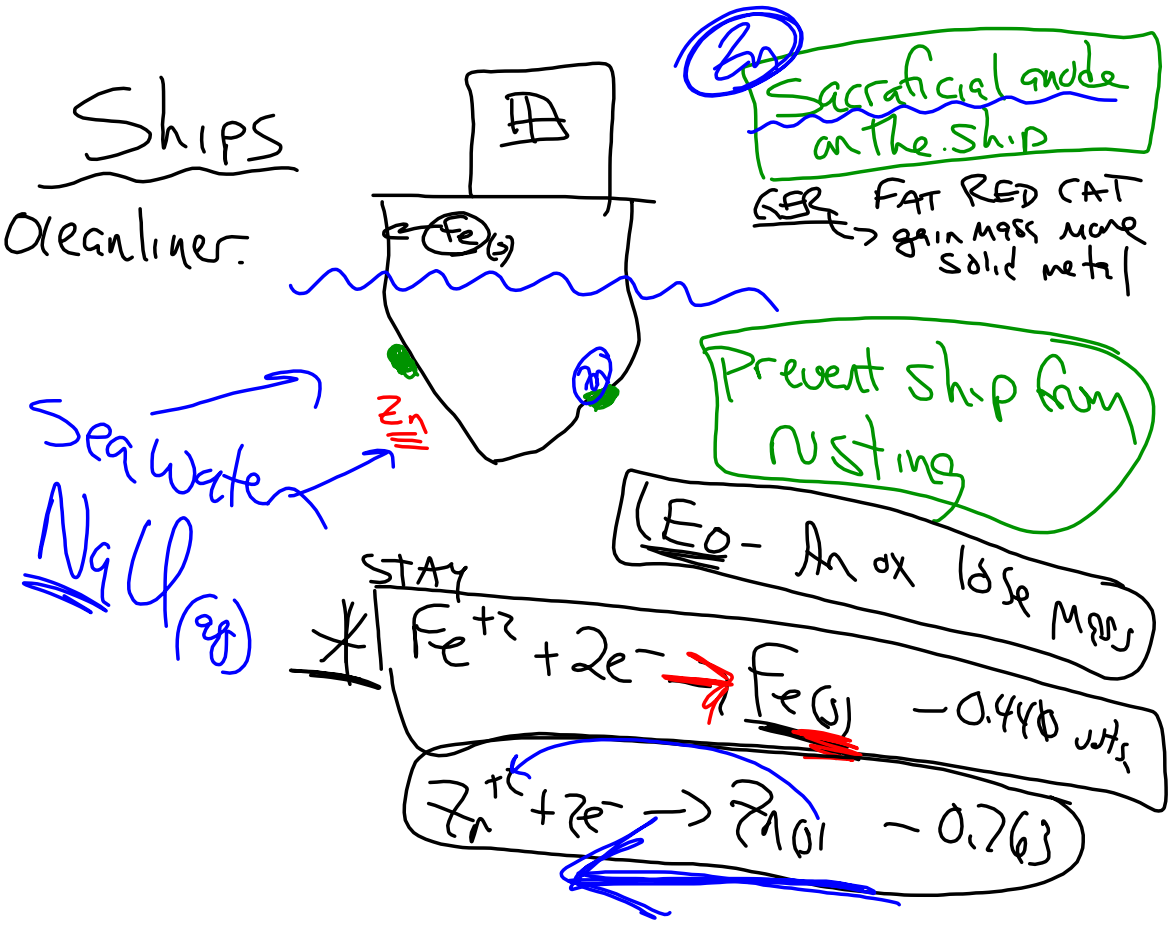
Shorthand for echem cell

"correction factor" for non std conditions

$$E = E^\circ - \frac{RT}{nF} \ln Q$$

$$E = +0.794 - \frac{(8.314)(298)}{(6)(96{,}500)} \ln(5 \times 10^{-11})$$

$$E = +0.895\ V$$



HW 20/ 61+64