Today: Start ch 19

Tuesday: expt 12, problem club with Ali

lab TA applications available

What mass of silver is deposited at the same time as a Cr electrode loses 2.20 g producing Cr^{3+}

$Ag^+ + e^- \rightarrow Ag \quad E°_{red} = +0.80\,V$

$Cr^{3+} + 3e^- \rightarrow Cr \quad E°_{red} = -0.74\,V$

$$n_{Cr} = \frac{2.20\,g \mid 1\,mol}{52.00\,g} = 0.0423\,mol\ Cr$$

$3Ag^+ + Cr \rightarrow Cr^{3+} + 3Ag \quad E° = +1.54\,V$

$$n_{Ag} = \frac{0.0423\,mol\ Cr \mid 3\,mol\ Ag}{1\,mol\ Cr} = \frac{0.1269\,mol\ Ag \mid 107.9\,g}{mol} = \boxed{13.7\,g\ Ag}$$

· What is E° for the following? $Cr \mid Cr^{3+}(0.25\,M) \parallel Ag^+(0.10\,M) \mid Ag$

$$E = E° - \frac{0.0592}{n} \log Q_c$$

$$E = +1.54\,V - \frac{0.0592}{3} \log\left(\frac{(0.25)}{(0.10)^3}\right)$$

$E = 1.54\,V - 0.0473 = \boxed{1.49\,V}$

· How many moles of electrons are transferred during this reaction?

How many coulombs? ← charge

$$n_{e^-} = \frac{0.0423\ Cr \mid 3\,mol\ e^-}{1\,mol\ Cr} = \boxed{0.127\,mol\ e^-}$$

$$charge = \frac{0.127\,mol\ e^- \mid 96500\,coul}{1\,mol\ e^-} = \boxed{12255.5\,coul}$$

$^{1}_{1}H + {}^{1}_{1}H \rightarrow H_2 \quad \Delta H = -436\ kJ/mol\ H_2$

$^{1}_{1}H + {}^{1}_{1}H \rightarrow {}^{2}_{1}H + {}^{0}_{1}B \quad \Delta E = -0.42\ MeV$

(isotope)

mass # = # p + # n

$^{1}_{1}H$

1 protons

$$\frac{-0.42\ MeV}{1\ MeV} \left| \frac{1.60\times10^{-13}\ J}{} \right| \frac{6.02\times10^{23}}{mol} \left| \frac{1\ kJ}{1000\ J} \right. = \boxed{-4.05\times10^{7}\ kJ}$$

releases much more energy

time world — going to big world

· Isotopes

$^{12}_{6}C$	$^{13}_{6}C$	$^{14}_{6}C$
6p	6p	6p
6n	7n	8n
stable		unstable (radioactive), decays, $t_{1/2} = 5730\ yr$

In upper atmosphere, high energy neutrons:

$$^{14}_{7}N + {}^{1}_{0}n \rightarrow {}^{14}_{6}C + {}^{1}_{1}H$$

$\rightarrow {}^{14}CO_2 \rightsquigarrow$ food chain

· light blue (from diagram) - too many neutrons (beta emission)

$^{1}_{0}n \rightarrow {}^{1}_{1}p + {}^{0}_{-1}B$ ~ B = high energy electron

$^{171}_{68}Er \rightarrow {}^{0}_{-1}B + {}^{171}_{69}Tm$

· too few neutrons (gray = positron emission or electron capture, orange = alpha emission)

$^{163}_{68}Er \rightarrow {}^{0}_{1}B + {}^{163}_{67}Ho$ (B = positron) - positron emission

$^{163}_{68}Er + {}^{0}_{-1}e \rightarrow {}^{163}_{67}Ho$ (e- from 1s orbital) - electron capture

$^{153}_{68}Er \rightarrow {}^{4}_{2}\alpha + {}^{149}_{66}Dy$ (α = alpha)

· nuclear processes all follow first order kinetics

$$\ln \frac{(\text{decay counts}_0)}{(\text{decay counts}_t)} = kt \qquad t_{1/2} = \frac{0.693}{k}$$