Chem 12 — Hw set 7 — non-graded part

A. Ch 11 47. a. $Au^{3+} + 3\,Tl \longrightarrow Au + 3\,Tl^{+}$

$\mathcal{E}^\circ = 1.50 + 0.34 = 1.84\ V$

b. we'll be doing this soon, so I'll add this part —

$\Delta G^\circ = -nF\mathcal{E}^\circ = -(3\ mol\ e^-)(96{,}485\ C/mol\ e^-)(1.84\ J/C)$ (Volts)

$= -533\ kJ$!

$K = e^{-\Delta G^\circ/RT}$ $(T = 298K)$

$= 2.3 \times 10^{93}$!! ok, that rxn goes to completion.

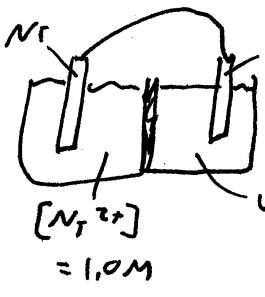
c. $[Au^{3+}] = 1.0 \times 10^{-2} M$, $[Tl^+] = 1.0 \times 10^{-4} M$

$$\mathcal{E} = \mathcal{E}^\circ - \frac{0.0257\ V}{n} \ln\left(\frac{[Tl^+]^3}{[Au^{3+}]}\right)$$

$$\mathcal{E} = 1.84\ V - \frac{0.0257\ V}{3} \ln\left(\frac{(1.0\times10^{-4})^3}{(1.0\times10^{-2})}\right)$$

$= 2.04\ V$

55.



a. $\mathcal{E} = 0\ V$

b. $\mathcal{E} = -8.9\ mV$, so e^-s flow left to right.

c. $\mathcal{E} = +29.6\ mV$

d. $\mathcal{E} = +130\ mV$

e. If both solns have same conc, $\mathcal{E} = 0V$!

e^- flow will depend on whether conc. of N_i^{2+} in right cell is higher or lower than that in left. If lower, e^-s will flow right to left to reduce N_i^{2+} in left part & oxidize N_i to N_i^{2+} in right.

$N_i^{2+}(L) + N_i(R) \longrightarrow N_i(L) + N_i^{2+}(R)$

$$\mathcal{E} = \mathcal{E}^\circ - \frac{0.0257\ V}{2} \ln \frac{[N_i^{2+}(R)]}{[N_i^{2+}(L)]}$$

$\mathcal{E}^\circ$ = 0; $[N_i^{2+}(L)]$ = 1.0 M

Hw set 7 - ng.

59. Cathode $0.10\ M\ Ag^+ \rightarrow Ag$

anode $Ag \rightarrow Ag^+$ (with $0.050\ M\ S_2O_3^{2-}$, $+ 1.0 \times 10^{-3}\ M\ Ag(S_2O_3)_2^{3-}$)

a. $$0.76\ V = 0 - \frac{0.0257\ V}{1} \ln\left(\frac{[Ag^+(aq)]}{0.10\ M\ Ag^+(cat)}\right)$$

$$[Ag^+(aq)] = 1.4 \times 10^{-14}\ M$$

b. $$Ag^+ + 2\ S_2O_3^{2-} \rightleftharpoons Ag(S_2O_3)_2^{3-}$$

$$K = \frac{[Ag(S_2O_3)_2^{3-}]}{[Ag^+][S_2O_3^{2-}]^2} = \frac{(1.0 \times 10^{-3}\ M)}{(1.4 \times 10^{-14}\ M)(0.050\ M)^2}$$

$$K = 2.9 \times 10^{13}$$

B. Ch 10 16. ΔS increases during: (a) melting, (b) evaporation, (c) sublimation, (e) mixing, (f) diffusion

17. (a) ΔS inc with inc in V

(b) $\Delta S = 0$ since $\Delta V = 0$

(c) inc in $P \Rightarrow$ dec in V, so ΔS decreases

38. I meant to specify b, c, d only

(b) $S°$ is higher for the gas

(c) " "

(d) N_2O has more vibrational & rotational "disorder" than He, so its entropy is higher (under standard conditions)

39. (a) $\Delta S°$ negative (dec in "disorder")

(b) positive (inc. in "disorder")

(c) neg.

(d) neg.

(e) gas → solution + 1 molecule → 2 ions - tough call

(f) pos