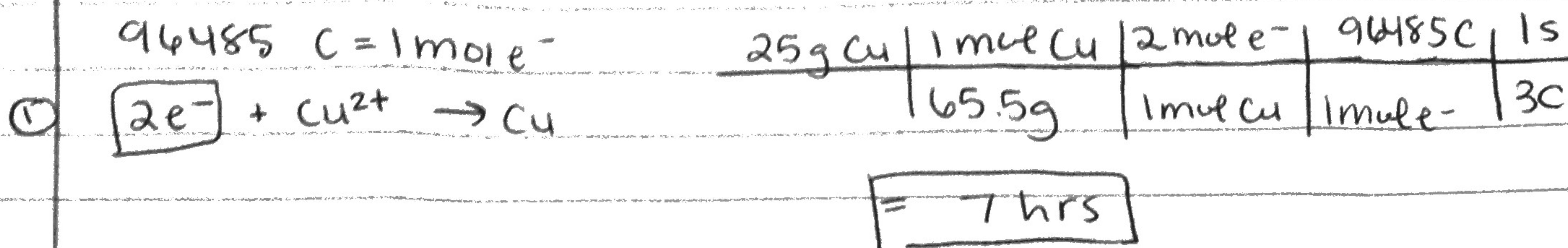


Current in Electrolytic Cells

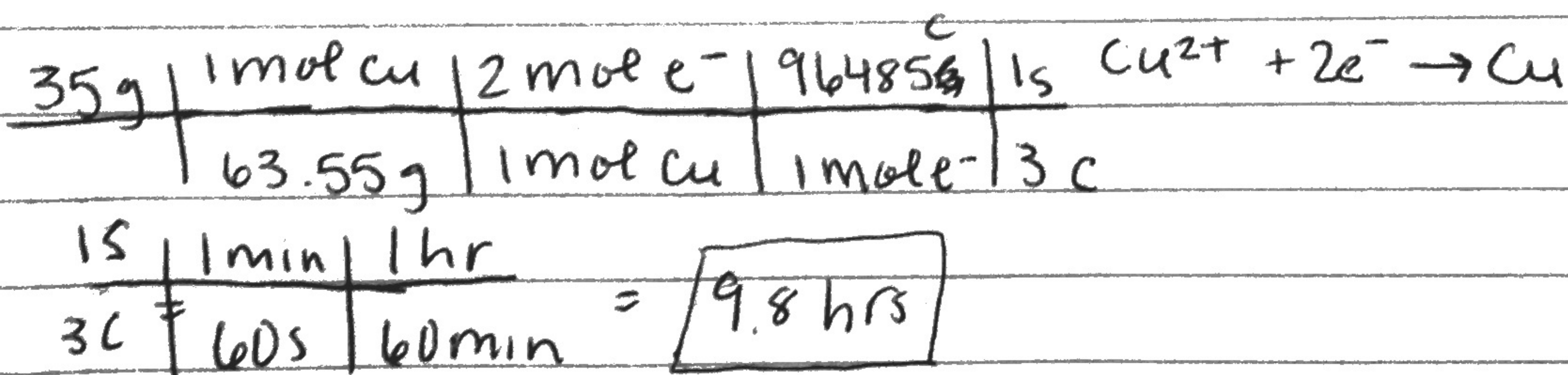
AMPS sec
 current \times time \rightarrow charge \rightarrow mol e^- \rightarrow mol of X \rightarrow X ^{gram}

Ex: How many hrs. is required to plate 25 g Cu from 1 M $CuSO_4$ by using current of 3 A?

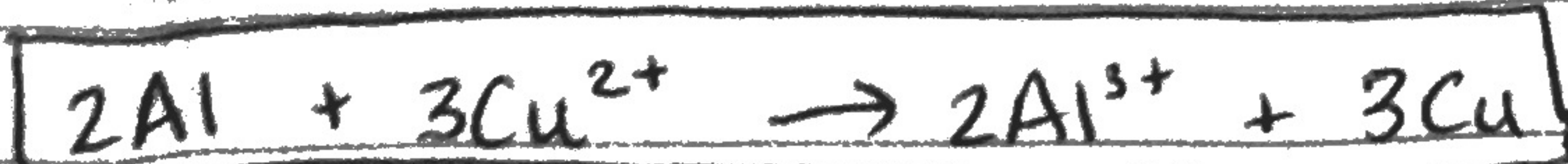
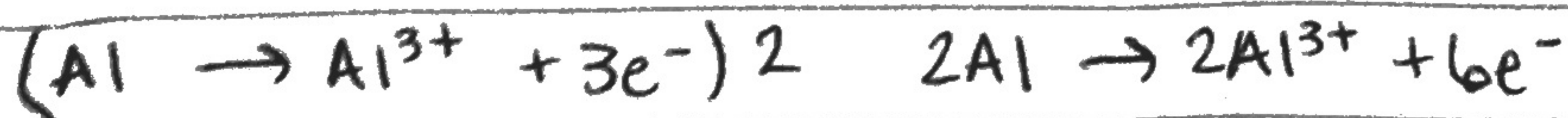
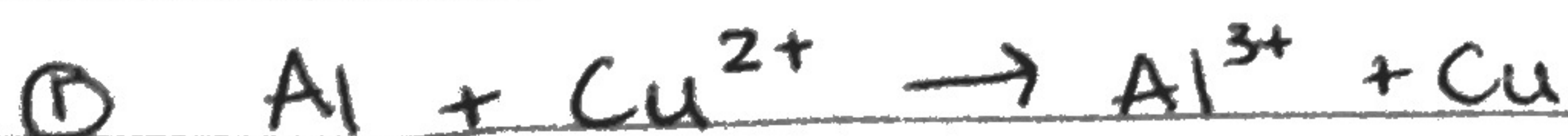


Lecture 4-22-14

- current \times time = charge
- ** • How many hrs. is required to plate 35 g Cu from 0.5 M $CuSO_4$ by using a current of 3 A



ACTIVITY: EXTRACTING WORK FROM CHEM CHANGE.



$$\Delta G = [2(-481.2) + 3(0)] - [2(0) + 3(65.5)] = -962.4 - 196.5 = -1158.9 \text{ kJ/mol}$$

spontaneous

$\Delta G = -RT \ln K$

~~very large and negative~~



$K = e^{-\Delta G/RT}$

convert to J

answer

This rxn favors the product. Since ΔG is very large and negative, favoring the products, K is very very large.

- spontaneous rxn that favors products gives large positive voltage for standard potential

$w = -qV$

(work = charge * voltage)

(neg sign shows that work done by the system)

Electron = - (charge * voltage)

* voltage is E, potential of the cell.

* total charge = # e⁻ / mol rxn, n, times F.

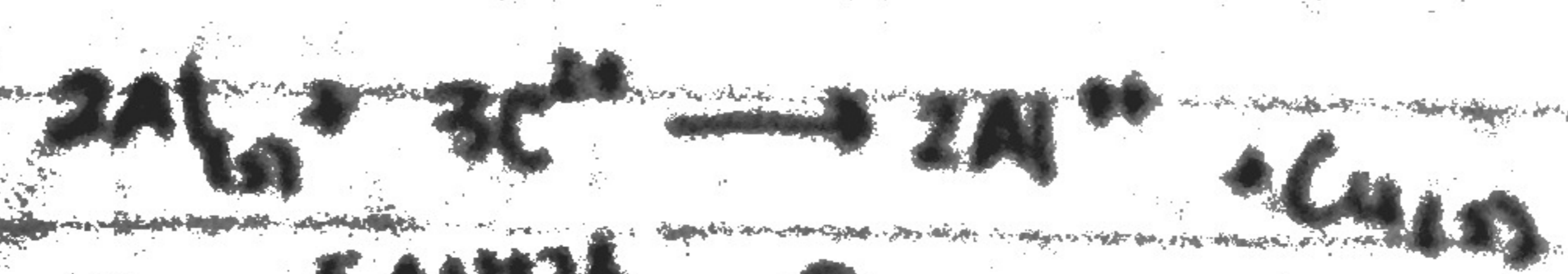
$\Delta G = -nFE$

electrical potential is different way of measuring the free energy

* when ΔG is neg, the voltage is positive

- Standard conditions -> everything 1M.

is this @ equilibrium? if not, predict direction of rxn based on standard cond conc. (Q is K)?



solids don't count

$Q = \frac{[Al^{3+}]^2}{[Cu^{2+}]^3}$ @ standard, Q = 1

@ standard, $K = \text{really big}$. $Q \ll K$.
favours products.

As it goes to product, conc. of Cu^{2+} dec.
 and Al^{3+} inc.

So when gets to eq, free energy diff is gone ($G=0$). This is standard ΔG .

$$\Delta G = -nFE$$

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

⊖

$$-nFE = -nFE^\circ + RT \ln Q$$

↑
potential
on cell
now.

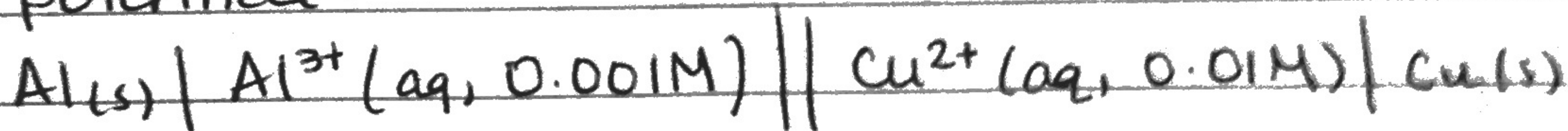
↑
now

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

@ standard
 $Q=1$.

$$E = E^\circ - \frac{0.059V}{n} \log Q$$

calc. potential:



$$Q = \frac{[\text{Al}^{3+}]^2}{[\text{Cu}^{2+}]^3} = \frac{(0.001\text{M})^2}{(0.01\text{M})^3} = 1$$

⊙ write out
balanced eq.

$$= 2V$$

what happens to V
as I change Q ?

inc. conc. of prod, ~~is~~ dec.
 conc. of react, voltage dec.