Electrochemistry Formula Sheet:

Facts to Know:

1. Oxidation occurs at the anode.
2. Reduction occurs at the cathode.
3. Oxidation occurs with a loss of electrons.
4. Reduction occurs with a gain of electrons.

Cell Potential:

$$E^o{}_{Cell} = E^o{}_{Cathode} - E^o{}_{Anode}$$

$$\Delta G = W_{max}$$

Gibbs Free Energy:

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

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

The Equilibrium Constant:

$$K = e^{nFE/RT}$$

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

The Nernst Equation:

$$E = E^o - \frac{0.0591 \log Q}{n}$$

$$Q = 10^{-n(E-E^o)/0.0591}$$

$$F = 96{,}485 \ C/mol \ e^-$$

The Nernst Equation:

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

$$Q = e^{-nF(E-E^o)/RT}$$

$$R = 8.3145 \ J/mol \cdot K$$

Unit Conversions for Electroplating:

$$1 \ mol \ e^- = 96{,}485 \ C$$

$$1C = 1A \cdot 1s$$

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$$Cu^{2+} + 2e^- \rightarrow Cu$$

$$1 \ mol \ Cu = 2 \ mol \ e^- \quad n = 2$$

Voltage (emf) and Work:

$$W = QV \qquad 1 \ Volt = \frac{1 \ J}{1 \ C}$$

Charge and Current:

$$Q = It \qquad 1 \ Amp = \frac{1 \ C}{1 \ s}$$

Additional Notes:

Reaction:	Cell Potential:	Gibbs Free Energy:	Equilibrium:	Position of K:
Spontaneous	$E^o{}_{cell} = +$	$\Delta G^o = -$	$K > 1$	Product Favored
Equilibrium	$E^o{}_{cell} = 0$	$\Delta G^o = 0$	$K = 1$	Neutral
Nonspontaneous	$E^o{}_{cell} = -$	$\Delta G^o = +$	$K < 1$	Reactant Favored