Unit 11 – Electrochemistry

1. Oxidation #'s: H = +1 (except in a hydride when it is -1) O = −2 (except in a peroxide when it is -1).
2. LEO goes GER … Oxidation always occurs at the anode in both a battery and an electrolytic cell.
3. Electrons in a battery flow from anode (−) to cathode (+).
4. Salt bridge: Cations flow to the cathode, and the anions flow to the anode.
5. While a battery is discharged, the cathode gains mass and the anode loses mass.
6. If you reverse a rxn, the sign of E^o_{cell} changes, but if you double a reaction, E^o_{cell} DOES NOT change!!
7. $E^o_{cell} = E^o_{Red\ (GER)} - E^o_{Red\ (LEO)}$ (The other way to calculate $E^o_{cell} = E^o_{Reduction} + E^o_{Oxidation}$ ...but that involves reversing one of the reactions and changing the sign for E^o_{Red})
8. E°cell for a concentration cell is zero.
9. Q for a concentration cell is always [low]/[high]
10. The half-reaction with a more (+) E^o_{Red} is the reaction that takes place at the cathode...GER.
11. When adding the two half reactions together, the electrons MUST cancel out.
12. $\Delta G^o = -nFE^o$ If ΔG^o is (−), then E^o_{cell} is (+). Reminder: n = # of electrons transferred
13. If Q increases, then the voltage (E^o_{cell}) of the battery goes down.
14. Electroplating/Electrolysis Calculation: $grams = \frac{(molar\ mass\ of\ metal)(amps)(seconds)}{(moles)(F)} \ldots g = \frac{(MM)(I)(t)}{nF}$

Thou Shalt Not Forget Questions

Credit: Dan Reid

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1. a) When does hydrogen NOT have a +1 Oxidation # (besides when it is a pure element)?
   b) When does oxygen NOT have a -2 oxidation number (besides when it is a pure element)?
2. What does LEO goes GER and OIL RIG and "AN OX RED CAT" stand for?
3. Electrons in a battery flow in which direction?
4. In the salt bridge, which direction do the cations ions flow? The anions?
5. While a battery is discharged, does the mass of the cathode increase or decrease? The anode?
6. If you reverse AND double a redox reaction, what happens to the magnitude AND sign of E^o_{cell} ?
7. Given the reduction potentials for the half reactions, how do you calculate E^o_{cell}?
8. What is E°cell for a concentration cell?
9. What is the value of Q for a concentration cell if Cu^{2+} on one side is 0.2 M, and 0.4M on the other side?
10. The half-reaction with a more (+)E^o_{Red} is the reaction that takes place at which electrode? The one with the more (-)E^o_{Red} takes place at which electrode?
11. When adding the two half reactions together, what is true about the # of electrons that are gained or lost?
12. a) If ΔG^o is (−), then is E^o_{cell} positive or negative? If ΔG^o (+), then is E^o_{cell} positive or negative?
    b) $\Delta G^o = -nFE^o$, what does 'n' refer to?
13. If Q increases, then does the voltage (E^o_{cell}) of the battery goes up or down? If Q decreases?
14. Electroplating/Electrolysis Calculation Shortcut: grams of metal electroplated = _____?