

# Thou Shalt Not Forget

Credit: Dan Reid

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## 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  $E^\circ_{\text{cell}}$  changes, but if you double a reaction,  $E^\circ_{\text{cell}}$  DOES NOT change!!
7.  $E^\circ_{\text{cell}} = E^\circ_{\text{Red (GER)}} - E^\circ_{\text{Red (LEO)}}$  (The other way to calculate  $E^\circ_{\text{cell}} = E^\circ_{\text{Reduction}} + E^\circ_{\text{Oxidation}}$  ...but that involves reversing one of the reactions and changing the sign for  $E^\circ_{\text{Red}}$ )
8. The half-reaction with a more (+)  $E^\circ_{\text{Red}}$  is the reaction that takes place at the cathode...GER.
9. When adding the two half reactions together, the electrons MUST cancel out.
10.  $\Delta G^\circ = -nFE^\circ$  If  $\Delta G^\circ$  is (-), then  $E^\circ_{\text{cell}}$  is (+). Reminder: n = # of electrons transferred
11. If Q increases, then the voltage ( $E^\circ_{\text{cell}}$ ) of the battery goes down.
12. Electroplating/Electrolysis Calculation:  $grams = \frac{(molar\ mass\ of\ metal)(amps)(seconds)}{(moles)(F)} \dots g = \frac{(MM)(I)(t)}{nF}$

# Thou Shalt Not Forget Questions

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## Unit 11 – Electrochemistry

- When does hydrogen NOT have a +1 Oxidation # (besides when it is a pure element)?
  - When does oxygen NOT have a -2 oxidation number (besides when it is a pure element)?
- What does LEO goes GER and OIL RIG and “AN OX RED CAT” stand for?
- Electrons in a battery flow in which direction?
- In the salt bridge, which direction do the cations ions flow? The anions?
- While a battery is discharged, does the mass of the cathode increase or decrease? The anode?
- If you reverse AND double a redox reaction, what happens to the magnitude AND sign of  $E^\circ_{\text{cell}}$  ?
- Given the reduction potentials for the half reactions, how do you calculate  $E^\circ_{\text{cell}}$ ?
- The half-reaction with a more (+) $E^\circ_{\text{Red}}$  is the reaction that takes place at which electrode? The one with the more (-) $E^\circ_{\text{Red}}$  takes place at which electrode?
- When adding the two half reactions together, what is true about the # of electrons that are gained or lost?
- If  $\Delta G^\circ$  is (-), then is  $E^\circ_{\text{cell}}$  positive or negative? If  $\Delta G^\circ$  (+), then is  $E^\circ_{\text{cell}}$  positive or negative?
  - $\Delta G^\circ = -nFE^\circ$  , what does ‘n’ refer to?
- If Q increases, then does the voltage ( $E^\circ_{\text{cell}}$ ) of the battery goes up or down? If Q decreases?
- Electroplating/Electrolysis Calculation Shortcut: grams of metal electroplated = \_\_\_\_\_?