

Electrochem-1

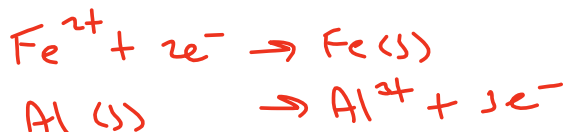
Thursday, April 13, 2017 5:15 AM

Electrochemistry



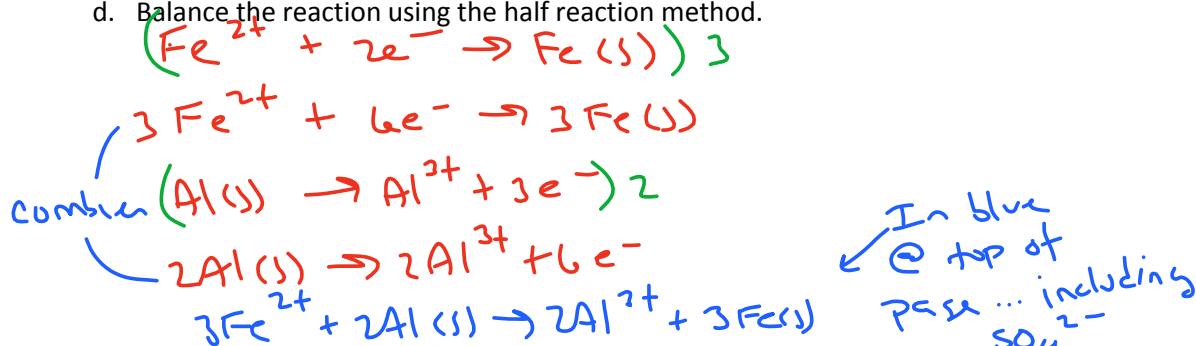
1. Consider the following reaction: $\text{FeSO}_4(\text{aq}) + \text{Al}(s) \rightarrow \text{Al}_2(\text{SO}_4)_3(\text{aq}) + \text{Fe}(s)$

- a. Is this a redox reaction? **Yes ... Fe & Al are changing charges**
 b. If so, write out the oxidation and reduction half reactions.



c. What is the oxidizing agent? Fe^{2+} How about the reducing agent? $\text{Al}(s)$

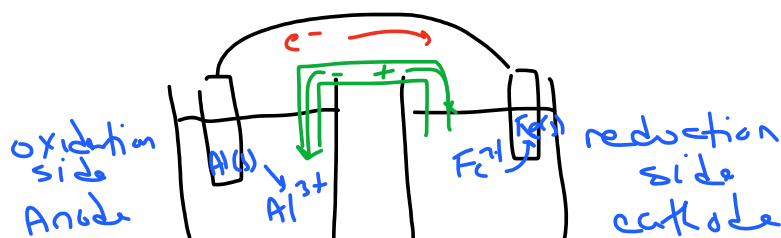
d. Balance the reaction using the half reaction method.



e. Determine E° for each half reaction. Is this reaction spontaneous as written?



f. Sketch a galvanic cell composed of these reactants and products.



$$1.66 - 0.44 = 1.22 \text{ V}$$

This is spontaneous

g. Using the standard shorthand method,



h. How many electrons are transferred from the reducing agent to the oxidizing agent?

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i. Determine DG° for this reaction.

$$\Delta G^\circ = -6(96,485)(1.22 \text{ V}) = -706270 \text{ J/mol}$$

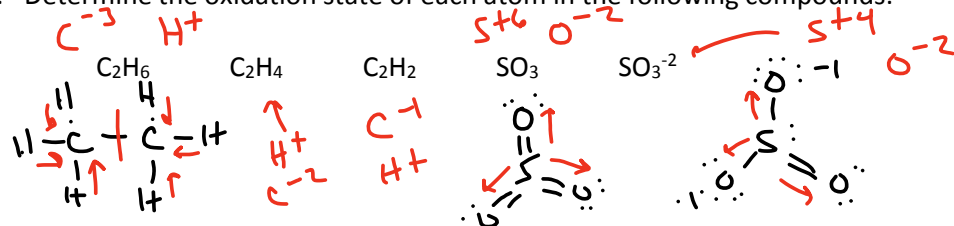
j. Determine DG at 25 °C if $[\text{FeSO}_4] = 250 \text{ mM}$ and $[\text{Al}_2(\text{SO}_4)_3] = 1 \text{ nM}$.

$$\Delta G = -706270 + 8.314(298.15) \ln \frac{1 \times 10^{-9}}{(0.25)^3}$$

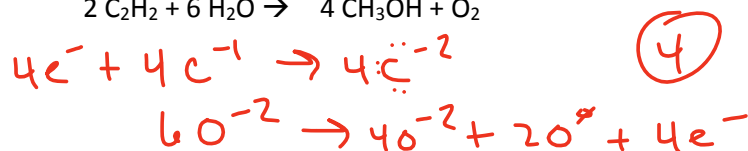
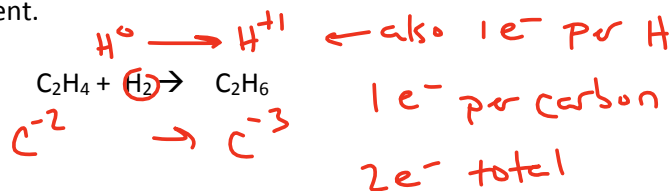
$$\Delta G = -706270 + 8.314(298.15) \ln \frac{1}{(0.25)^3}$$

$$\Delta G = -706270 - 41060 = -747330 \text{ J/mol}$$

2. Determine the oxidation state of each atom in the following compounds:



3. Using only oxidation states, determine how many electrons are transferred from the reducing agent to the oxidizing agent.



4. Balance this reaction using the $\frac{1}{2}$ reaction approach.

