AP Chemistry Daily Videos

9.8 Cell Potential and Free Energy

Video #1

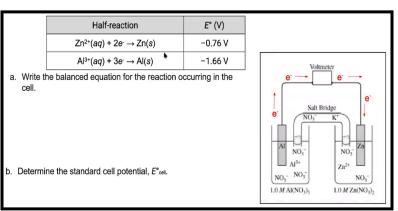
- 1. What is voltage?
- 2. What is a half cell?

Half-reaction			$E^{\circ}(V)$
$F_2(g) + 2e^-$	\rightarrow	2F-	2.87
$\text{Co}^{3+} + e^{-}$	\rightarrow	Co ²⁺	1.82
$Au^{3+} + 3e^{-}$	\rightarrow	Au(s)	1.50
$\operatorname{Cl}_2(g) + 2e^-$	\rightarrow	2C1-	1.36
$O_2(g) + 4H^+ + 4e^-$	\rightarrow	$2H_2O(l)$	1.23
$Br_2(l) + 2e^-$	\rightarrow	2Br	1.07
$2 \text{Hg}^{2+} + 2e^{-}$	\rightarrow	Hg_2^{2+}	0.92
$Hg^{2+} + 2e^{-}$	\rightarrow	Hg(l)	0.85
$Ag^+ + e^-$	\rightarrow	Ag(s)	0.80
$Hg_2^{2+} + 2e^-$	\rightarrow	$2 \operatorname{Hg}(l)$	0.79
$Fe^{3+} + e^{-}$	\rightarrow	Fe ²⁺	0.77
$I_2(s) + 2e^-$	\rightarrow	21	0.53
$Cu^+ + e^-$	\rightarrow	Cu(s)	0.52
$Cu^{2+} + 2e^{-}$	\rightarrow	Cu(s)	0.34
$Cu^{2+} + e^-$	\rightarrow	Cu ⁺	0.15
Sp4+ + 2 =-	_	C-2+	0.15

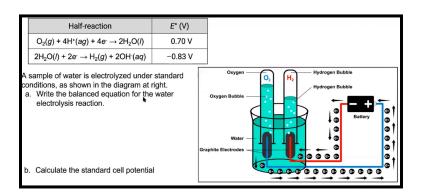
3. Describe what information can be obtained by looking at the table of half-reactions. Make sure your answer includes standard conditions, the symbol for standard conditions, what a reduction potential is, and how you can obtain the voltage for an oxidation process.

- 4. Why are substances with the most positive values favored in reduction reactions? (Hint: What are electrons attracted to?).
- 5. Describe what is E°_{cell} and how it can be calculated.
- 6. @ 4:24, go back to 9.7 and complete the table on page.
- 7. While balancing half reactions, what happens to E° value when you multiple a half reaction? What happens to E°when you reverse a reaction?

8. Try the problem on your own. Then evaluate your work and identify any errors you may have made.



9. Try the problem on your own. Then evaluate your work and identify any errors you may have made.



10. Summarize the 5 main points from this video.

Video #2

11. Describe each variable in this equation.

$$\Delta G^{\circ} = -n \mathcal{F} E^{\circ}_{cell}$$

- How does ΔG relate to E°_{cell} ? 12.
- 13. Try part c from #9's problem.
- c. Determine the standard free energy of reaction for this reaction.

Try the problem on your own. 14. Then evaluate your work and identify any errors you may have made.

Half-reaction	E° (V)
$Fe^{2+}(aq) + 2e^{-} \rightarrow Fe(s)$	-0.45 V
$Al^{3+}(aq) + 3e^- \rightarrow Al(s)$	-1.66 V

- a. Write the balanced equation for the reaction occurring in
- b. Determine the standard cell potential, E°_{cell}.
 c. Does the concentration of Al³+ in the solution increase, decrease, or remain the same as the cell operates? Explain your answer.
- d. Calculate the standard free energy of reaction, ΔG° .
- e. Is the value of the equilibrium constant ($K_{\rm eq}$) at 25°C greater than, less than, or equal to 1? Explain your answer.

