CH17B

I. E^0_{cell}, E_{cell}, ΔG^0, ΔG, K, and Q for a Galvanic cell (Voltaic cell):

a. $\Delta G^0 = -nFE^0_{cell} = -RT\ln K$

b. $E^0_{cell} = -(RT/nF)*\ln K$ or $E^0_{cell} = (1/n)*0.025693*\ln K$

c. $E_{cell} = E^0_{cell} - (RT/nF)*\ln Q$ or $E_{cell} = E^0_{cell} - (1/n)*0.025693*\ln Q$

d.   For a spontaneous process, $\Delta G < 0$ or $E_{cell} > 0$

II. Electroplating

a. LORA and GROC still hold

b. structure of a electrolysis cell

c. $C = A*s$; $n_e = C/F$; $n_{product} = n_e/n_{ET}$; $g_{product} = n_{product}*MM_{product}$ (molar mass)

$$g_{product} = \frac{A \times s}{n_{ET} \times F} \times MM_{product}$$

III. Electrolysis: product of electrolysis

a. molten salt: cation $\rightarrow$ cathode, E^0

anion $\rightarrow$ anode, E^0_{oxi} $V_{minimum} = E^0 + E^0_{oxi}$

b. mixed molten salts: cation with less negative E^0 got reduced first

anion with less negative E^0_{oxi} got oxidized first

c. aqueous salt solution: same as mixed molten salts but need to consider H_2O

$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$ E^0 $= -0.83$ V

$2H_2O \rightarrow O_2 + 4H^+ + 4e^-$ E^0_{oxi} $= -1.23$ V
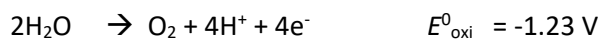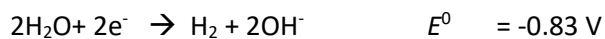
CH17B

17B.I

1. A voltaic cell consists of an Pb/Pb^{2+} half-cell and an Sn/Sn^{2+} half-cell. What is the value of the equilibrium constant at 25 °C Use the reduction potential values for $Sn^{2+}(aq)$ of -0.14 V and for $Pb^{2+}(aq)$ of -0.13 V. Give your answer using E-notation with NO decimal places (e.g., 2×10^{-2} would be 2E-2; and 2.12×10^{-2} would also be 2E-2.). Do NOT include spaces, units, punctuation or anything else silly! [**3E-1**] *can you also do ΔG^0?*

2. A voltaic cell consists of an Al/Al^{3+} half-cell and an Fe^{2+}/Fe^{3+} half-cell. Calculate Ecell when conc. of Fe^{2+}= 1 M, Fe^{3+}= 0.1 M and Al^{3+}= 0.1 M. Use the reduction potentials for Al^{3+} is -1.66 V and for Fe^{3+} is 0.77 V. [**2.39**]

17B.II

3. How many coulombs are required to produce 10 g of iron metal from a solution of aqueous iron(III)chloride. Use scientific (E) notation with 2 numbers after the decimal point. [**5.19e4**] *can you also do amp and time?*

4. How many grams of manganese may be formed by the passage of 5 amps for 1.5 hours through an electrolytic cell that contains a molten Mn(IV) salt. [**3.84**]

5. In the electrolysis of molten LiBr, which product forms at the anode? [**Br$_2$**]

6. Hydrogen can be prepared by suitable electrolysis of aqueous rubidium (Rb) salts [**True**]

7. Oxygen can be prepared by suitable electrolysis of aqueous perchlorate salts [**True**]

8. What product(s) forms at the cathode in the electrolysis of an aqueous solution of K$_3$PO$_4$? [**H$_2$ and OH$^-$**]