1. Consider the following half reactions and standard reduction potentials.

$Au^{3+}(aq) + 3\ e^- \rightarrow Au(s)$ $E° = +1.400$ V

$Cl_2(g) + 2\ e^- \rightarrow 2\ Cl^-(aq)$ $E° = +1.358$ V

$Cu^{2+}(aq) + 2\ e^- \rightarrow Cu(s)$ $E° = +0.342$V

$2\ H^+(aq) + 2\ e^- \rightarrow H_2(g)$ $E° = 0$ V

$Cd^{2+}(aq) + 2\ e^- \rightarrow Cd(s)$ $E° = -0.403$ V

$Zn^{2+}(aq) + 2\ e^- \rightarrow Zn(s)$ $E° = -0.762$ V

   A) Circle (○) the strongest oxidizing agent and box (□) the strongest reducing agent.

   B) Write the balanced chemical equation and cell diagram for the Galvanic cell with the <u>largest</u> standard cell potential (E^o_{cell}).

2. How long will it take to plate 0.0625 g of solid copper from an aqueous solution of copper(II) sulfate with a current of 0.200 A? Note: 1 A = 1 C/s and F = 96,500 C/mol e^-

3. A Galvanic cell is constructed using two Au electrodes and two Au^{3+} solutions: one is 0.123 M and the other is 0.449 M. Fill in the concentrations in the cell diagram below for this cell?

$$Au(s) \mid Au^{3+}(\ \_\_\_\_\_\ M) \mid\mid Au^{3+}(\ \_\_\_\_\_\ M) \mid Au(s)$$

4. You construct the following Galvanic/voltaic cell at 298.15 K.

$$Pt(s) \mid Cr^{2+}(0.30\ M), Cr^{3+}(2.00\ M) \mid\mid Co^{2+}(0.20\ M) \mid Co(s) \quad E^o_{cell} = +0.220\ V$$

What will the potential of the cell be after 0.10 M of Cr^{2+} is consumed?

Assume that volume and temperature do not change.

$E_{cell} = E^o_{cell} - \frac{RT}{nF} \ln Q$

5. You construct the following Galvanic cell at 298.15 K.

$$\text{Fe}\,(s)\ |\ \text{Fe}^{2+}\,(0.10\ \text{M})\ ||\ \text{Cd}^{2+}\,(0.95\ \text{M})\ |\ \text{Cd}\,(s) \qquad E^{o}_{\text{cell}} = +0.044\ \text{V}$$

The initial mass of the Fe electrode is 100.0 g and the volumes of the solutions are 1.00 L each. What will the cell potential be when the mass of the Fe electrode is 62.0 g? {Fe = 55.85 g/mol}

Assume that temperature does not change.

6. You construct a voltaic cell using the two reactions given.

$$\text{Sn}^{2+}\,(aq) + 2\ \text{e}^- \rightarrow \text{Sn}\,(s) \qquad E^\circ = -0.143\ \text{V}$$

$$\text{Pb}^{2+}\,(aq) + 2\ \text{e}^- \rightarrow \text{Pb}\,(s) \qquad E^\circ = -0.131\ \text{V}$$

If the cell starts with $[\text{Sn}^{2+}] = 1.35$ M and $[\text{Pb}^{2+}] = 2.11$ M at 298.15 K, what will be the concentration of Pb^{2+} when the cell is "dead"?

7. Consider a voltaic cell with the following cell diagram at 298.15 K.

$$\text{Pb}\,(s)\ |\ \text{Pb}^{2+}\,(1.00\ \text{M})\ ||\ \text{Cu}^{+}\,(1.00\ \text{M})\ |\ \text{Cu}\,(s)$$

A) What will happen to the cell potential if $[\text{Pb}^{2+}]$ is doubled?

Increases Decreases Stays the same

B) What will happen to the cell potential if $[\text{Cu}^{+}]$ is doubled?

Increases Decreases Stays the same

C) What will happen to the cell potential if we added enough water to double the volumes of both the anodic and cathodic solutions?

Increases Decreases Stays the same