FLINN SCIENTIFIC

Name_____

Demonstration #1 Worksheet

The Voltaic Cell

1. Using the table of standard reduction values, determine $\varepsilon^{\circ}_{Cell}$ for this voltaic cell arrangement?

2. Write the Nernst equation for this cell.

3. Before the leads are connected, predict the results for the new voltage value when a 0.01 M zinc sulfate solution is substituted for the 1 M zinc sulfate solution.

4. What would happen to the voltage if 50 mL of distilled water were added to the left beaker containing 1 M copper sulfate solution?

Demonstration #2 Worksheet

Electrolysis

Data Table

Initial pH _____ Elapsed time: _____ min. _____sec.

Final pH _____

1. For this electrolysis reaction, the species present in solution are potassium ions, K^+, iodide ions, I^-, and water molecules. The standard reduction or oxidation potential for these species are:

$$2I^-(aq) \rightarrow I_2(s) + 2e^- \qquad E° = -0.535\ V$$
$$2H_2O(l) \rightarrow O_2(g) + 4H^+(aq) + 4e^- \qquad E° = -1.229\ V$$
$$2H_2O(l) + 2e^- \rightarrow H_2(g) + 2OH^- \qquad E° = -0.828\ V$$
$$K^+(aq) + e^- \rightarrow K(s) \qquad E° = -2.925$$

   Based on these oxidation and reduction potential values, write the half cell reactions and the overall oxidation–reduction reactions that occur.

2. Recall that current is the flow of electrons and is measured in amperes, A. One ampere represents the flow of one coulomb of charge per second. Faraday's constant relates the coulomb to electrons and has the value of 96, 500 coulombs per moles of electrons.

   Refer to the oxidation—reduction equation for this electrolysis. Relate the number of moles of electrons, e^-, transferred to the number of moles of hydroxide ions, OH^-, produced.

3. Based on the pH values, calculate the initial and final hydroxide ion concentrations, $[OH^-]$.

   How many moles of hydroxide ions were produced? How many coulombs of electrons were transferred?

   What was the average current, A, for this electrolysis?

Demonstration #3 Worksheet

Concentration Cell

1. What is the $\varepsilon^{\circ}_{Cell}$ value for this voltaic cell arrangement?

2. Write the Nernst equation for this cell.

3. Is this cell spontaneous? If so, where is the anode? Cathode?

4. What would happen to the voltage if 50 mL of distilled water were added to the left beaker containing 0.01 M zinc sulfate solution?