

Lab 3 Report

Electrochemical Determination of Thermodynamic Values

Name:

Lab partner's name:

Experimental data:

At room temp

Temp for copper sulfate is 21.5C

At 2 V is 0.500

At ice bath

Temp for copper sulfate is 7C

At 2 V is 0.497

At hotplate

Temp for copper sulfate is 64.9C

At 2 V is 0.514

Graph of the data:

[In this section, you attach your graph of the data, including the line of best fit.]

Explanation for the graph:

[In this section, you explain *why* you made a graph. Do not simply tell me what the graph is – that is obvious, assuming you labeled your axes correctly. Instead, explain the chemical principles that were involved in deciding to make a graph in the first place. What information can be gleaned from the graph? In fact, why does the voltage change with temperature at all?]

Final calculations:

[Here you combine your results from the graph with any other pertinent information, resulting in your final value for the ΔH and ΔS for the reaction.]

Justification for your calculations:

[As before, do not simply tell me what you did. Explain the chemical principles that were involved in deciding to manipulate the numbers the way you did.]

Post-lab questions:

- 1) For the data point taken at high temperature (the one above 50°C), if your lab partner misread the thermometer and recorded a temperature that was much lower than in fact it was, would your resulting ΔH and ΔS be too positive, too negative, or unchanged? *Thoroughly* justify your response.
- 2) If your lab partner mistakenly graphed the Celsius temperature instead of the Kelvin temperature, would your resulting ΔH and ΔS be too positive, too negative, or unchanged? *Thoroughly* justify your response.
- 3) If your lab partner used a tin electrode which was significantly larger than the copper one, would your resulting ΔH and ΔS be too positive, too negative, or unchanged? *Thoroughly* justify your response.
- 4) According to the table provided in your PowerPoint notes, copper has a reduction potential of +0.34 V. Tin, however, is not listed on this table. Calculate an experimental value for this number from the cell potential you measured at room temperature. Show your work. Look up the literature value for the reduction potential for tin and calculate the percent error. (As in previous labs, include a reference for your literature source, and show the math for your percent error calculation.)

- 5) For the cell to be operating under standard conditions, the concentration of both solutions should be 1.0M. Use the Nernst equation to show that the cell potential should still be the same if both solutions have a concentration of 0.5M.