

Instructions for Experiment A6

Setting up the Vernier equipment and obtaining measurements for Part 1

1. Connect the conductivity probe to the LabQuest Mini interface box through channel 1.
2. Connect the LabQuest Mini interface box to the laptop computer using the USB cable. The USB ports are found in the back of the laptop on the right hand side when the screen is facing you.
3. Connect the computer to the Ethernet using the Ethernet cable and the port located on the lab bench. The Ethernet port for the computer is located in the back of the laptop on the right hand side when the screen is facing you.
4. **IMPROTANT:** Make sure that the conductivity probe is set on the 0-20,000 $\mu\text{S}/\text{cm}$ position. If you receive an error message stating that the settings are incorrect/different, it is because the toggle on the probe is in the wrong position. Clamp the probe on to the ring stand as illustrated in Figure 1.

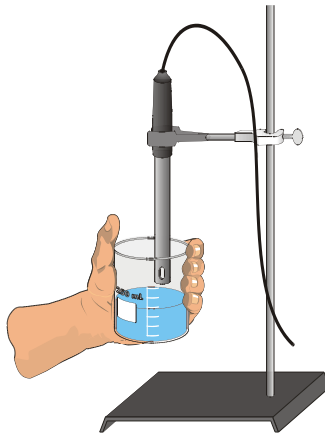


Figure 1

5. **IMPROTANT:** Prepare the computer to monitor conductivity by opening the file "Conductivity 1" from the Chemistry 1A desktop folder.
6. To measure the conductivity of a solution: Carefully raise the container with the solution whose conductivity is to be measured up around the Conductivity Probe until the hole near the probe end is completely submerged in the solution being tested. Important: Since the two electrodes are positioned on either side of the hole, this part of the probe must be completely submerged.


7. Briefly swirl the bottle contents. Once the conductivity reading has stabilized, record the value in your data table. Note: It is normal for the conductivity reading to fluctuate to a small degree.
8. Before testing the next solution, clean the probe by again rinsing it with deionized water from a wash bottle. Blot the outside of the probe end dry using a tissue. Remember, it is not necessary to dry the inside of the hole near the probe end.

The following instructions pertain to measurements in Part 2 of the experiment

1. Connect the conductivity probe to the LabQuest Mini interface box through channel 1.
2. Connect the LabQuest Mini interface box to the laptop computer using the USB cable. The USB ports are found in the back of the laptop on the right hand side when the screen is facing you.
3. Connect the computer to the Ethernet using the Ethernet cable and the port located on the lab bench. The Ethernet port for the computer is located in the back of the laptop on the right hand side when the screen is facing you.
4. IMPORTANT: Make sure that the conductivity probe is set on the 0 2000 $\mu\text{S}/\text{cm}$ position. (This is a different setting than used in the first part of the experiment). If you receive an error message stating that the settings are incorrect/different, it is because the toggle on the probe is in the wrong position. Clamp the probe on to the ring stand as illustrated in Figure 1. In addition, also use a buret clamp to hold the 2.00 mL Microburet.
5. IMPORTANT: Prepare the computer to monitor conductivity by opening the file "**Conductivity 2**" from the Chemistry 1A desktop folder. (This is a different file than used in the first part of the experiment.)
6. Using a graduated cylinder add 35.0 mL of deionized water to a clean 50 mL beaker. Using a 25 mL beaker obtain about 10-15 mL of 0.05 M NaCl solution from the large stock bottle.
7. Clean the probe by surrounding it with the 250 mL beaker and rinsing it with deionized water from a wash bottle. Blot the outside of the probe end dry using a KimWipe tissue. It is not necessary to dry the inside of the hole near the probe.
8. Before adding any drops of solution:
 - a. Click .
 - b. Carefully raise the beaker and its containing the 35.0 mL of deionized water up around the Conductivity Probe until the hole near the probe end

is completely submerged in the solution being tested. Important: Since the two electrodes are positioned on either side of the hole, this part of the probe must be completely submerged.

- c. Monitor the conductivity of the deionized water until the conductivity reading stabilizes.
 - d. Click and then lower the beaker away from the probe. Type "0.00" (for 0.00 mL's added) in the edit box that appears on the screen. Press the ENTER key to store this data pair. This gives the conductivity of the water before any salt solution is added.
9. You are now ready to begin adding salt solution.
- a. Rinse and fill the 2.00 mL microburet with 0.05 M NaCl solution.
 - b. Add 0.10 mL of 0.05 M NaCl solution to the 35.0 mL of distilled water.
 - c. Raise the beaker until the hole near the probe end is completely submerged in the solution. Swirl the solution briefly.
 - d. Monitor the conductivity of the solution until the reading stabilizes.
 - e. Click , and then lower the beaker away from the probe. Type "0.10" (the total volume in mL's added) in the edit box and press ENTER.
10. Repeat the Step 10 procedure by adding another 0.10 mL of 0.05M NaCl to the beaker, but this time entering "0.20" (the total volume in mL's added).
11. Continue this procedure, adding 0.10 mL portions of 0.05 M NaCl solution, measuring conductivity, and entering the total volume added—until a total of 0.80 mL has been added. At anytime you may click on the button located just below the menu bar to expand the graph.
12. Click when you have finished collecting data. Dispose of the beaker contents as directed by your teacher. Rinse the probe tip with deionized water from a wash bottle. Carefully blot the probe dry with a tissue.
13. Important: From the Experiment menu, choose Store Latest Run. This stores the data so it can be used later, but it will still be displayed while you do your second and third trials.
14. Repeat Steps 8-14, this time using 0.05 M AlCl₃ solution in place of 0.05 M NaCl solution.
15. Repeat Steps 8-14, this time using 0.05 M CaCl₂ solution.

16. Click on the Linear Fit button, . Be sure all three data runs are highlighted, then click . A best-fit linear regression line will be shown for each of your three runs. In your data table, record the value of the slope, m , for each of the three solutions. (The linear regression statistics are displayed in a floating box for each of the data sets.)

17. To print a graph of concentration vs. volume showing all three data runs:

- a. Label all three curves by choosing Text Annotation from the Insert menu, and typing "sodium chloride" (or "aluminum chloride", or "calcium chloride") in the edit box. Then drag each box to a position near its respective curve.
- b. From the File menu select Print Graph. Print a copy of the graph, with all three regression lines displayed. Enter your name(s) and the number of copies of the graph you want. Make certain that each lab partner has his/her own copy.
- c. From the File menu select Print Data. Print a copy of the data table making sure that all three sets of data are present. Make certain that each lab partner has his/her own copy.