Using the MicroLab Environmental Interface

1. Turn on the computer. For any passwords, hit "Esc". Turn on the MicroLab Environmental interface (the switch is located in the back of the interface on the right.) Look for the green light in the upper left corner of the interface - if it is lit, the interface is on.

2. On the computer, open the "MicroLab" icon by double clicking it.

3. Under “Choose an Experiment Type” select the “pH Titrations” tab. Select “**CH223TitrationExpt**” and press OK.

4. **Connect the pH probe** to the pH terminal (on the back side toward the left of the interface) **and the drop counter** to the "A" terminal (in the lower left of the interface). Position a clean **buret** over the drop counter and make sure the drop counter is working properly by sending a few drops through the "cross hair" square opening; if a red light flashes when a drop falls through the "cross hair", your drop counter is aligned with the buret. Gently place the pH probe into the circular hole on the drop counter; this will result in the pH probe hanging down from the body of the drop counter.

5. **Calibrate the pH probe**. Under “SENSOR” select “pH”, then press the “Edit” button. Select the “Perform New Calibration” button, then “Add Calibration Point.” Place the pH probe in a solution of known pH, wait for the probe to stabilize (i.e. the red line on the computer screen should remain in the green zone; this process should take seconds.) Once stabilized, enter the actual pH value under “Actual Value”, and then press OK. Repeat this process with one or two other known pH values. Select “First Order (Linear)” on the left and see the resulting correlation value of R. If you are content with the correlation, press “Accept and Save This Calibration”. Enter “pH” for the Units for the Calibration, and then press OK. Create a name for your calibration file, then press “Save”, and finally press “Finish.”

6. Under “Data Sources / Variables”, **click & drag “pH”** to the y-axis of your graph; also **click & drag “Counter”** to the x-axis of your graph. Your graph should now have pH on the left y-axis and Counter (number of drops) on the x-axis.

7. **Starting the experiment:** Fill the buret with titrant and the reaction flask with the solution to be analyzed. **Record the initial volume of the buret in mL**. Press “Start” to begin the experiment. Check the drop counter for measurement accuracy; every drop passed through the drop counter should register as a red light flash on the drop counter (don't add drops too quickly!)

8. When the titration is complete, press the "Stop" button. The reaction has been stopped, but the data has not been saved yet. **Record** the **total number of drops added** from the spreadsheet and the **total volume of titrant added (in mL)** from the buret during the reaction. To save the experiment, select “File” then “Save MicroLab File”; enter a file name under “Saved Experiments” and press “Save.”

9. **Convert the number of drops to mL**: Under “Data Sources / Variables”, select the “Add Formula” button. Next to “f(x) =” at the top, enter the formula **Counter * (*mL titrant*) / (*total drops*)** where ***mL titrant*** is the total volume of titrant added in mL and ***total drops*** is the total number of drops recorded by the drop counter. Type “Volume” for a label and “mL” for Units. Press "OK". **Click & drag the Formula for Volume** to the C column in the spreadsheet. Also drag the Formula for Volume to the x-axis on the graph, replacing "Counter" with the better "Volume" data.

10. **Create a first derivative** plot for your data by selecting the “Analysis” button in the graph area. Select “Plot a Derivative (Rate of Change)” then press “OK” and “OK” a second time. Notice in the “Data Sources/Variables” window in the upper left you have a new entry for “ANALYSIS (pH vs. Volume). **Click & drag the symbol** to Column D, and then re-drag the Symbol to the right side y-axis on the graph. You can alter the scale on the axes by selecting "Graph" then "Graph Properties". **Print** the graph by selecting the graph with the mouse first, then “File”, “Print” and “OK”.

11. **To export the data for later analysis in Excel**, select “File”, "Export Data As" and “Comma-Separated-Value text file.” Save the data on your own disk or in the "Saved Experiments" folder. The data file should have the extension .csv. Further information on using the MicroLab data in Excel can be found in the handout, "**Using MicroLab Data in Microsoft Excel**", which is found on the CH 223 website under "Labs".

12. To start a new titration, select “Repeat Exp” under “Data Sources / Variables”. You can save the current experiment if desired; otherwise, continuing will erase all data (but maintain your pH calibration.) Repeat the titration as before.