Calibration and use of pH meter using MicroLabTM interface

- 1. Turn on the computer and use the following login: User: All, Password: gustudent. Make sure the green light on the front of the MicroLabTM box is turned on (it is located within the "o" of the word MicroLabTM). If it is not turned on, press the green Power button to turn on the instrument. Note the number on your instrument and on your pH probe.
- 2. Open the MicroLabTM software by double clicking the MicroLab 5.8.4 icon located on the desktop.
- 3. Open a New MicroLab Experiment.
- 4. First you will need to tell the instrument what types of measurements it should collect. You will want to measure pH and time. The top left section of the window, titled "Data Sources / Variables" is where you define the data to be collected.
- 5. Click on the "Add Sensor" button to add the pH probe. From the sensor pull-down menu, select "pH / D.O." and then select the location in which it is plugged into the instrument by clicking a red box. Choose pH from the list of possible sensors. Then click "Next".
- 6. You will calibrate the pH probe yourself, so click "Perform New Calibration". Rinse the pH electrode and probe with deionized (DI) water three times and gently blot it dry with a Kimwipe[®]. Submerge the tip of the pH probe in the pH 4 buffer standard, and stir on a magnetic stir plate. Click "Add Calibration Point" and watch the voltage change. When the voltage settles on a value, enter the pH of that standard where it says "Actual Value" and click "OK". Rinse the pH probe and repeat adding calibration points with the pH 7 and pH 10 buffer standards. Fit your three points to a First Order (Linear) fit, and let your instructor know if the line does not fit the data well. Click "Accept and Save This Calibration" and enter a file name with today's date, your section number, and your initials. You have now calibrated the pH probe and return to the main screen.
- Click on the "Add Sensor" button to add the timer. From the sensor pull-down menu, select "Time" to add the timer. You will notice three red boxes appear to the right, for Timers 1, 2, or 3. Select one of these to use (typically, you will select Timer 1). After clicking "Next", you can select whether the timer measures in Seconds, Minutes, or Hours. For this experiment, Seconds is probably most appropriate. When you click "Finish", you will see the Timer has been added to your list of Sensors.
- 8. Next you can set up the window to output the data you will be measuring in useful ways for you to view. Drag the Timer and pH sensor from the Data Sources / Variables window to the Digital Display, data table, and graph axes (to graph pH vs. time). Remove the pH probe from its storage solution, rinse it thoroughly with deionized H₂O, gently blot it with a Kimwipe to dry it, and insert the probe into your solution. Press Start to begin measuring the pH over time. Stir your solution with a magnetic stir bar during all pH measurements. Make sure the electrode is completely submerged in the solution. Watch the graph of pH vs. time. Eventually, the pH should level out at some value. **Record** that value as the pH of your sample. Click "Stop" to stop recording pH values. Remove the pH probe from your solution, rinse it with deionized H₂O, blot it dry, and return it to the storage solution or your next solution to measure. **Never allow the probe to be left out of solution, as it will dry out.**
- 9. To perform another measurement, click "Repeat Experiment" and continue without saving your data.
- 10. Write an abbreviated version of this procedure in your notebook so you can refer to it in the future.

Use of drop counter using MicroLabTM interface

- 1. Turn on the MicroLabTM instrument and open the MicroLab 5.8.4 program on your computer. Open a New MicroLab Experiment.
- 2. As you did to measure pH, you will manually add the drop counter sensor to collect your data. Click on the "Add Sensor" button to add the drop counter. Select "Counter" from the Sensor menu, and click on the location where you have plugged the counter into the instrument. When you click "Finish", you will see the Counter has been added to your list of Sensors. Drag the Counter to the data table and Digital Display so you can see the counting occur.
- 3. One way to count drops using the drop counter will be to press "Start" to start the counting of drops. As it is set up, the program will collect data every 0.5 seconds, whether a drop is counted during that time or not. It may be more convenient to collect data every time a drop is counted. To change this, double click on "Repeat every 0.500 seconds" under Experiment Steps in the lower left corner of the window. Select "Repeat when counter change".

Use of a spectrophotometer using MicroLabTM interface

- 1. To measure the absorbance of samples:
 - a. Open MicroLab version 5.8.4. Open a New Spectrophotometer experiment.
 - b. To read a blank (not an empty vial, but one containing liquid that serves as a good blank for your sample), insert the vial all the way into the holder and cap the top. Press the "blank" button, and the instrument will go through measurements at each wavelength, setting each to 100% transmission. Check the box saying you will be measuring "Concentration (Beer's Law)".
 - c. To measure a sample, put a vial containing the sample into the sample holder and cap the top. Click "Add", enter a value for the concentration of the sample (you will need to calculate this before-hand) as well as a sample name. When you click "OK" the instrument will read the % transmission at all available wavelengths.
 - d. To change from viewing the % transmission to the absorbance, simply click the tab along the top of the screen. To change the wavelength whose absorbance values are shown in the table and graph simply click on the bar representing that wavelength.
 - e. To draw a bestfit line through your Absorbance vs. concentration plot, select "Curve Fit" from the tabs on the top left of the screen. Then select a Linear fit. The line, equation, and correlation coefficient will appear on your graph. Alternatively, you can export your data to Excel (or type the values in manually), and make your graph there.
- 2. To measure the absorbance of a sample over time:
 - a. Open a New Spectrophotometer experiment.
 - b. Read a blank and then check the box saying you will be measuring "Time (for Kinetics).

c. Change from viewing the % transmission to the absorbance at the wavelength you desire. Change the time interval to collect measurements however often you desire. When you are ready, click "Start" to begin data collection. When you are finished collecting measurements, click "Stop". You can save and then export your data using the File menu. The exported data file can be opened in Excel for analysis.