Experiment GB-2: Membrane Permeability Using the Oxygen Diffusion Chamber

Equipment Required

PC or Mac Computer

IX-TA and power supply

ODC-320: Osmosis and Diffusion Chamber

Dialysis tubing 32mm flat width (20 mm diameter) 2inches in length (3)

Distilled or deionized water

pH 4 and pH 7 buffer solutions

ISE-100 pH electrode

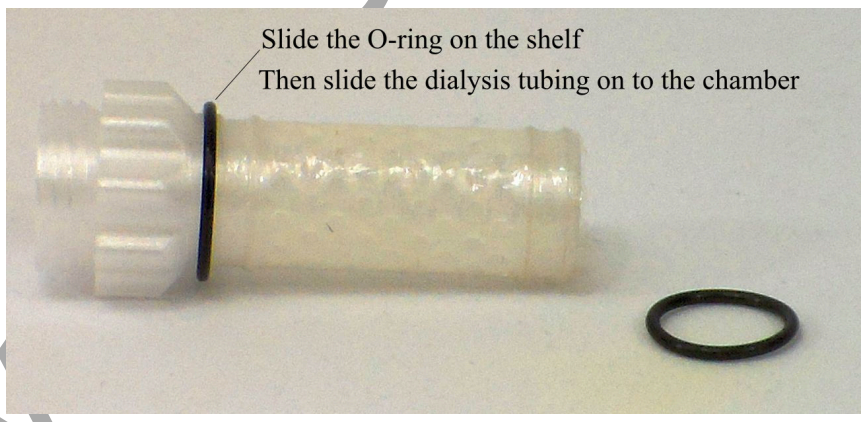
1.0M HCl solution

1.0M NaOH solution

1.0M Na Acetate solution

Oxygen Diffusion Chamber Setup

- Cut a piece of Dialyses tubing 2 inches long
- Place the Dialyses tube in water and open it.
- Slide one O-ring on the shelf
- Then slide the dialysis tubing on to the chamber
- Then slide the O-ring onto the tubing between the grooves
- Place the second O-ring at the bottom of the chamber in the grooves



Setup the Equipment

- Plug the ODC-320 cap to channel A7 on the front of the TA.

pH Electrode Setup

1. Locate the ISE-100 pH electrode and plug the DIN8 connector of the ISE-100 pH electrode into the Channel A5.

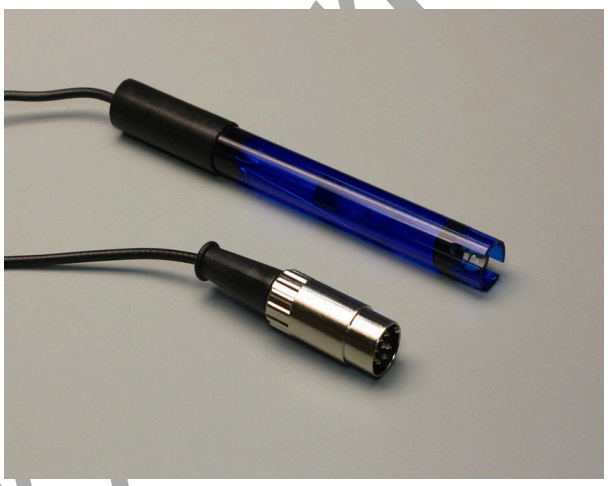


Figure GB-2-S1: The ISE-100 pH electrode.

Calibration of the pH Electrode

1. If the ISE-100 pH electrode is still stored in its bottle of buffer, remove the electrode from the bottle. Rinse the electrode with deionized water while holding the electrode over a 1000 ml beaker used for the collection of waste liquids.

2. Place the tip of the ISE-100 pH electrode in a 100 ml beaker containing enough room temperature deionized water to submerge the tip. Keep the electrode in deionized water for at least ten minutes.

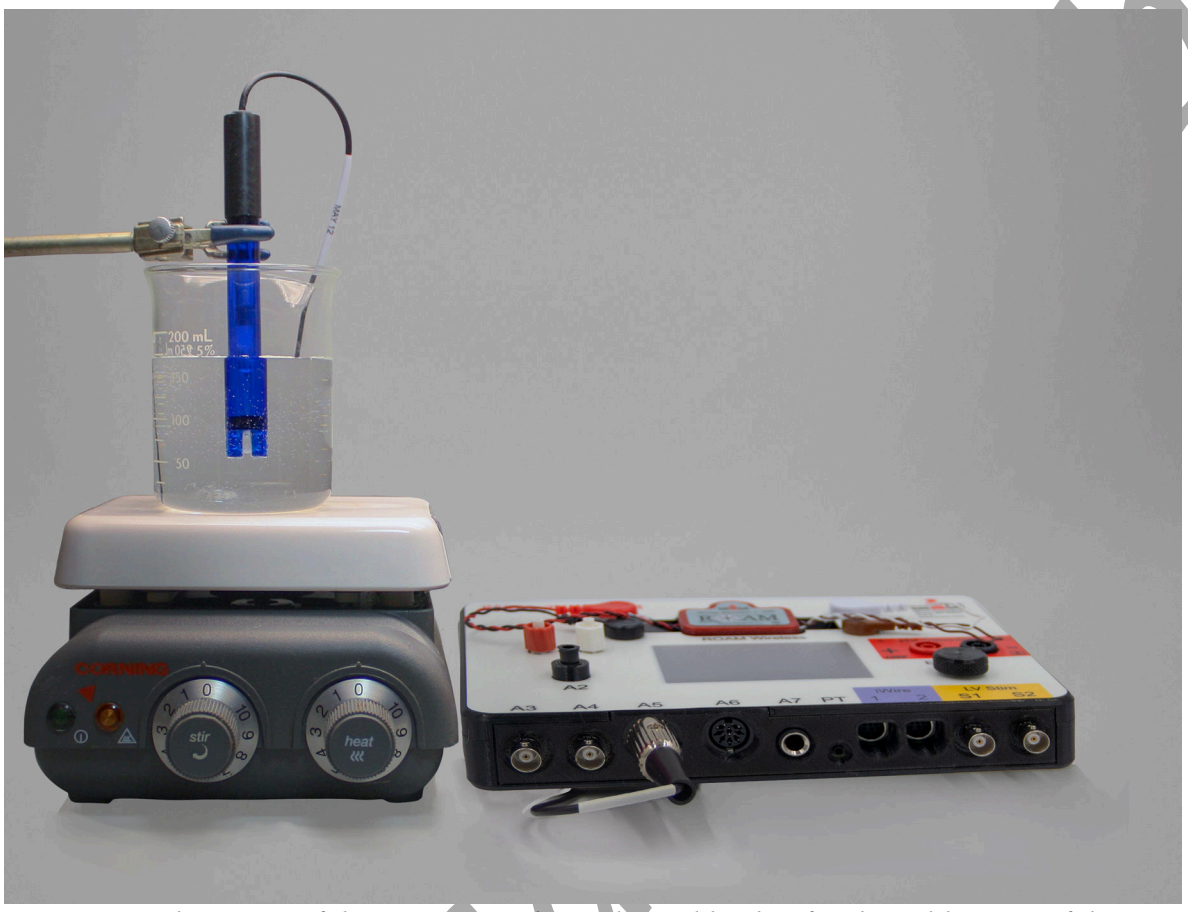


Figure GB-2-S2: The image of the stirrer, pH electrode, and beaker for the calibration of the pH probe.

3. Prepare two 100 ml beakers, each filled with 50 ml of the pH buffers used for calibrating the pH electrode. The buffers should be at room temperature. One beaker is filled with pH 7 buffer; and the other is filled with pH 4 buffer. Each beaker should be filled with enough buffer to cover the tip of the ISE-100 pH electrode, and also allow the stir bar in the beaker to spin without touching the electrode.
4. Place the beaker containing the pH 7 buffer on the magnetic stirrer. Carefully place a stir bar in the beaker. Remove the electrode from the deionized water and blot any extra drops of water. Position the tip of the electrode in the beaker of pH 7 buffer so that the tip is away from the stir bar. Adjust the speed of the stirrer so the stir bar is rotating evenly at a slow speed.
5. Click Record. After a few seconds, the trace will reach a stable baseline toward the top of the recording channel. Type the words **Calibration - pH 7** in the Mark box. Click the mark button to mark the stable baseline of the recording. This will mark the output of the ISE-100 pH electrode in pH 7 buffer. Continue recording while changing the beakers of buffers.

6. Turn off the stirrer and remove the ISE-100 pH electrode from the beaker of pH 7 buffer. Hold the electrode over the beaker used for collecting waste liquid and rinse it with deionized water. Blot any extra drops of water.
7. Place the beaker of pH 4 buffer on the stirrer making sure the stir bar can move freely.
8. As you continue to record, the trace will reach a stable baseline toward the bottom of the recording channel. Type the words **Calibration - pH 4** in the Mark box. Click the mark button.
9. Click Stop to halt the recording and Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.
10. Turn off the stirrer. Remove the electrode from the beaker of pH 4 buffer. Hold the electrode over the beaker used for collecting waste liquid, and rinse it with deionized water from a wash bottle. Blot any extra drops of water and place the electrode in a beaker of deionized water.

Units Conversion

1. Scroll to the beginning of the calibration data for the pH electrode.
2. Use the Display Time icons to adjust the Display Time of the Main window to show the data collected at pH 7 and pH 4 on the Main window at the same time.
3. Click the 2-Cursor icon so that two cursors appear on the Main window. Place one cursor on the flat section of data collected when the pH electrode was in the pH 7 buffer and the second cursor on the flat section of data collected when the electrode was in the pH 4 buffer.
4. To convert the voltages at the positions of the cursors to pH values, use the Simple Units Conversion dialogue window. Click on V2-V1 to the right on the pH channel and select Simple.
5. On the units conversion window, make sure 2 point calibration is selected in the pull-down menu in the upper-left corner of the window. Put a check mark in the box next to Apply units to all blocks. Notice that the voltages from the positions of the cursors are automatically entered into the value equations. Enter the two buffers used in the calibration recording in the corresponding boxes on the right side of the conversion equations. Click OK.

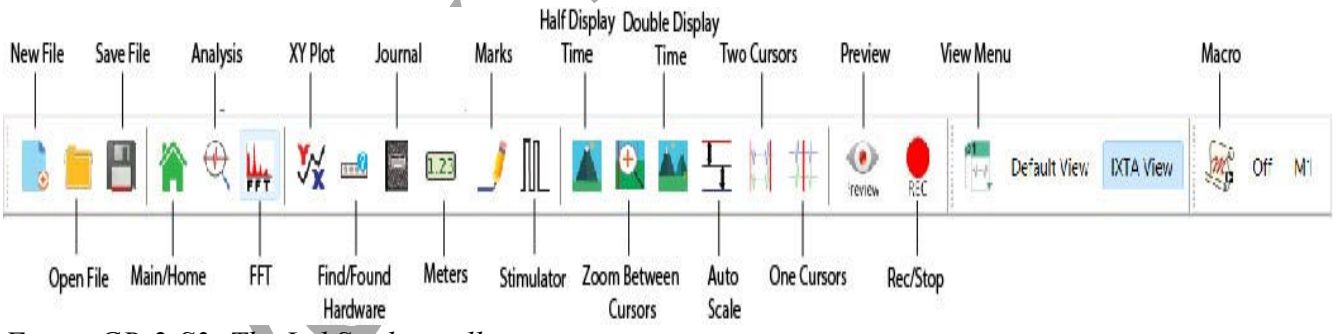


Figure GB-2-S3: The LabScribe toolbar

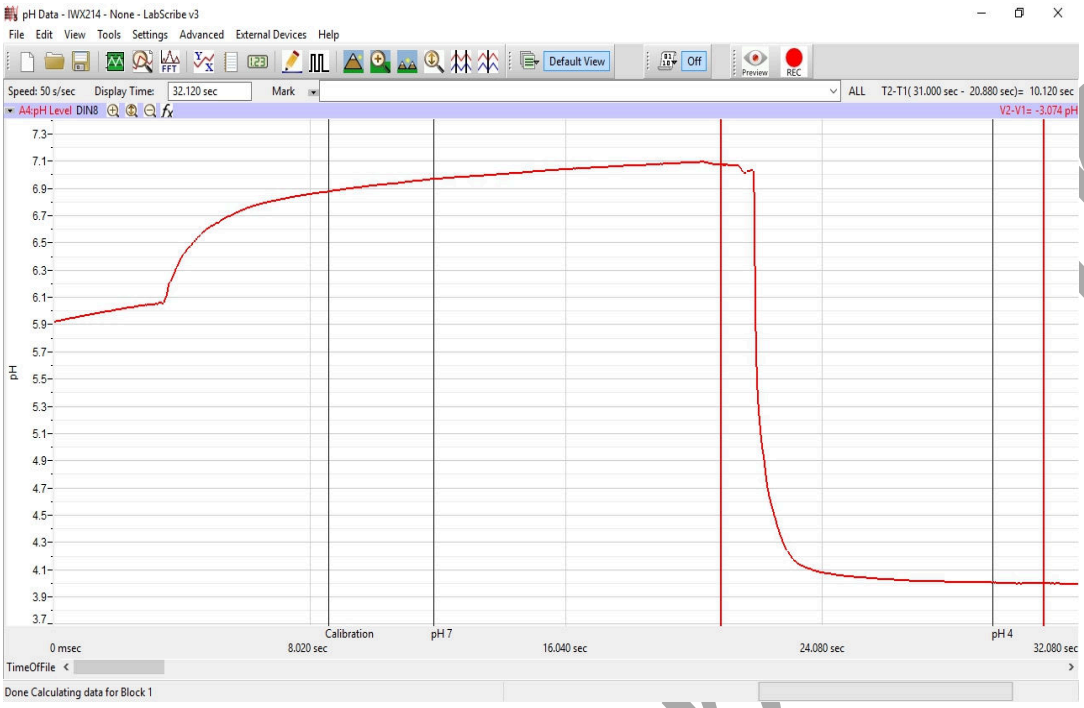


Figure GB-2-S4: pH data recorded showing positions of the cursors used for calibration.

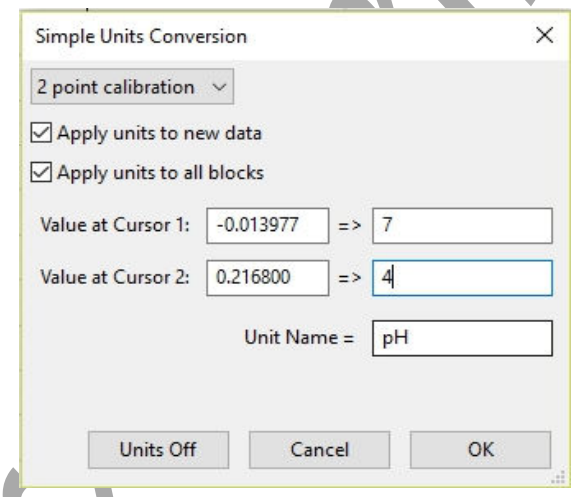


Figure GB-2-S5: The Simple Units Conversion dialogue window.

Preparation of the Oxygen Diffision Chamber

1. 1.0M HCl solution into the ODC chamber leaving a little space at the top.
2. Place the cap on the ODC chamber.
3. Make sure that there are no leaks from the chamber. If there are leaks, then the experiment will not work.

4. Place the ODC chamber in the beaker of distilled water along side the pH probe.
5. Rinse the outside of the chamber containing the 1.0M HCl with water to remove any acid that may have gotten on the outside.

NOTE: Between each test, clean out the chamber thoroughly with distilled water and use a new piece of dialysis tubing.

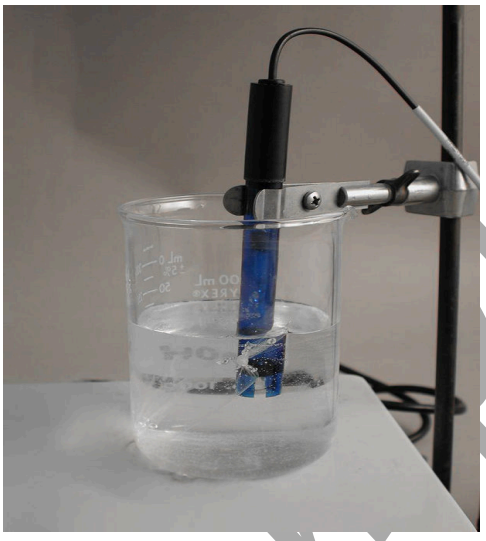


Figure GB-2-S6: View of the beaker with the ISE-100 pH electrode, The ODC will be placed next to the probe.