

pH and Buffers

You will be using pH electrodes connected to the Vernier LabPro system. pH electrodes have a thin glass bulb at the tip. They break easily and are costly to replace. Be careful not to drop or shove the electrode in to the bottom of the beaker. There is a protective guard around the tip, which should remain in place at all times. The guard will not protect against careless treatment.

For best results the electrodes are stored in a buffer solution when not in use. Immediately prior to use, the electrodes are rinsed with deionized water and gently blotted with a tissue, then placed in the test solution.

You will need to calibrate the pH probe before use. The software will take you through a two-point calibration. Calibrate the pH probes using the pH 4 and 10 buffers on the table.

- In the DataMate system, select setup, then select calibrate until you get to the two-point calibration.
- Place the probe in the pH 4 solution.
- When the voltage reading stabilizes, hit enter and the system prompts you for the pH value. Enter 4.
- The software will prompt you for the second reference point.
- Repeat for the pH 10 buffer.

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1. Using the 100.0-mL volumetric flask, prepare 100.0 mL of 0.60 *M* HC₂H₃O₂ by diluting the 6.0-*M* stock solution provided.

Show your calculation for preparing the 0.60-*M* HC₂H₃O₂ solution.

2. Using the other 100.0-mL volumetric flask, prepare 100.0 mL of 0.60 *M* sodium acetate by dissolving solid sodium acetate trihydrate (NaC₂H₃O₂ · 3 H₂O) in water and diluting to a total volume of 100.0 mL.

Show your calculation for the grams of NaC₂H₃O₂ · 3 H₂O.

3. Measure the pH of the solutions described in the data table below. Make sure the electrode bulb is fully immersed before measuring.

pH Data for Acetate Buffers

Solution	mL of 0.60 M HC₂H₃O₂	mL of 0.60 M NaC₂H₃O₂	pH
1	30	0	
2	0	30	
3	30	10	
4	10	30	
5	20	20	

4. Explain the pH for the five solutions. Consider the relative amounts of acid and base in each.