

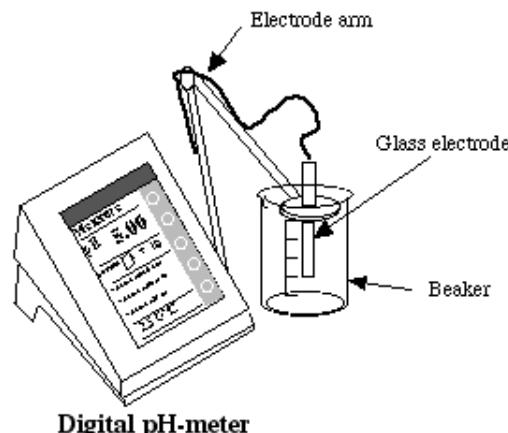
Appendix #2 Digital pH-Meter

Introduction

Several different methods are used to measure pH depending upon the accuracy needed. Dye coated papers or indicator solutions can be used for crude measurements. For example litmus coated papers can do no better than determine whether a solution is an acid or a base. The dye turns red when in acids where the $\text{pH} < 7$ and blue in bases where $\text{pH} > 7$. The indicator in red cabbage detects much smaller ranges, turning red at $\text{pH } 1\text{-}3$, pink at $\text{pH } 4$, shades of violet from $5\text{-}7$, blue at 8 and shades of blue-green from $9\text{-}12$. Dye-coated papers can detect pH to within 1 unit or even a half a pH unit.

For very accurate measurements, such as those needed to test normal blood which falls in the narrow range from 7.36 to 7.44., pH papers are of no use. Instead a pH-meter can be used to get a pH reading accurate to within 0.01 pH unit in less than a minute. The instructions below are for a digital pH meter.

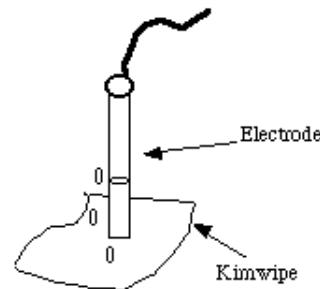
A digital pH meter is shown in the diagram on the right. A plastic electrode arm connects to the meter and holds the glass electrode in place for measurement. Sample solutions may be put in a beaker or in a vial. The glass electrode is sensitive to pH.



Digital pH-meter

Between each measurement, you must rinse electrodes with distilled water then “blot-dry” (don’t wipe) to absorb liquid on the electrode cover by gently touching with a Kimwipe.

CAUTION: Handle the electrode carefully to avoid even a slight scratch. The plastic electrode body *must* be kept moist at all times or it will be ruined.



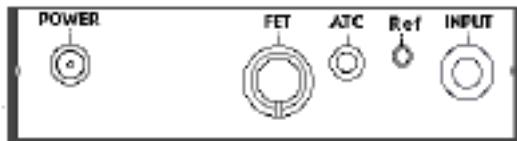
Equipment and Materials:

- pH meter, power cord, electrode arm, and an electrode
CAUTION: Leave the electrode in its storage bottle until it is ready to be used
- A plastic water wash bottle filled with distilled water
- Box of Kimwipes
- A 250 mL beaker for waste water
- Buffer solutions (pH 4,7, and 10) These are kept in vials and need not be removed for the pH measurement

Standardizing the pH meter

Since electrodes vary in their response, the pH meter with electrode must be standardized before measurements are taken.

1. Connect electrode arm to the base of the pH-meter.
2. Connect power cable to rear connector panel power jack and to a power source.



3. Connect the electrode wires to ATC and INPUT slots on the back of meter.
Plug in pH meter. Allow the instrument to warm up for at least 10 minutes

4. Press and release the **mode** key until the digital display reads **pH** (upper left)

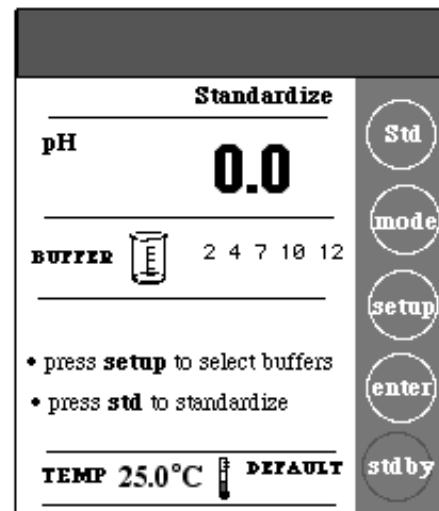
5. Press the **setup** key twice and then the **enter** key to clear an existing standardization.

6. Rinse and blot-dry electrodes.

Immerse electrode in the pH 4 buffer.

7. Press **std** to access the standardize mode. Briefly you should see a beaker and a set of numbers including the numbers 4 7 10.

Note: If you see the beaker with some other set of numbers such as 1 3 6 8 10 13, continue to press the **setup** key until you get to the picture of a beaker and a set of numbers including 4 7 10.



8. Press **std** again to start the standardization. A number close to 4 flashes on the screen. When the word **STABLE** comes up, the meter should return to the Measure screen . If it does not, ask an instructor.

Note: If the message **ELECTRODE ERROR** appears call an instructor. The electrode might not be working.

9. Repeat steps 6 - 8 above using pH 7 and pH 10 buffers. . When the meter accepts the second buffer it will briefly display a **% Slope**. If this is between 90-102%, the message **GOOD ELECTRODE** will appear.

After standardizing with the pH 7 and 10 buffers you are ready to perform experiments requiring a digital pH-meter.