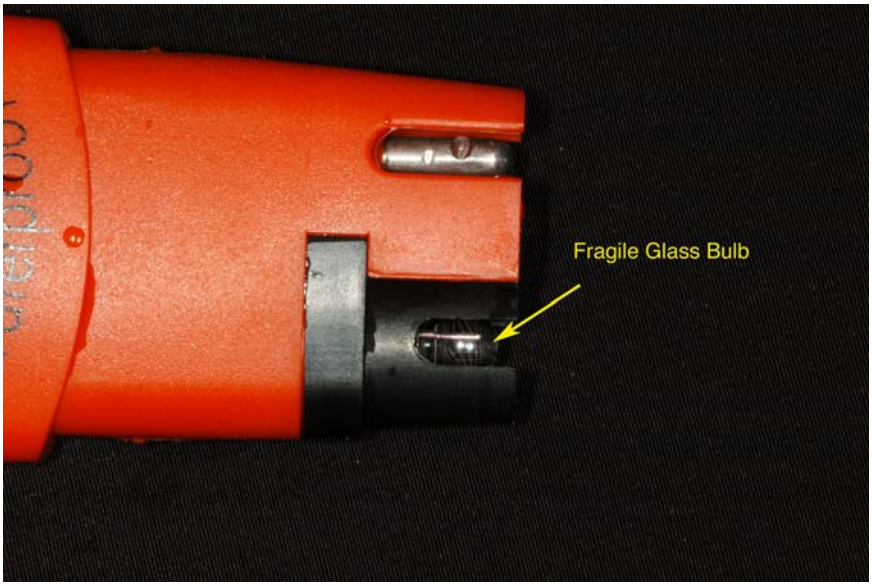
pH METER/WATER:

OVERVIEW:

The pHep is a waterproof pH pen for use in measuring the pH of aqueous solutions. The primary electrode ends in a glass globe that is protected by a plastic shield. It is relatively fragile and the instrument should only be used in water and not in hard substrates such as soil or mud. The accuracy of a pH measurement is temperature dependent; this unit measures temperature and electronically corrects for temperature effects (ATC on the screen stands for automatic temperature compensation).

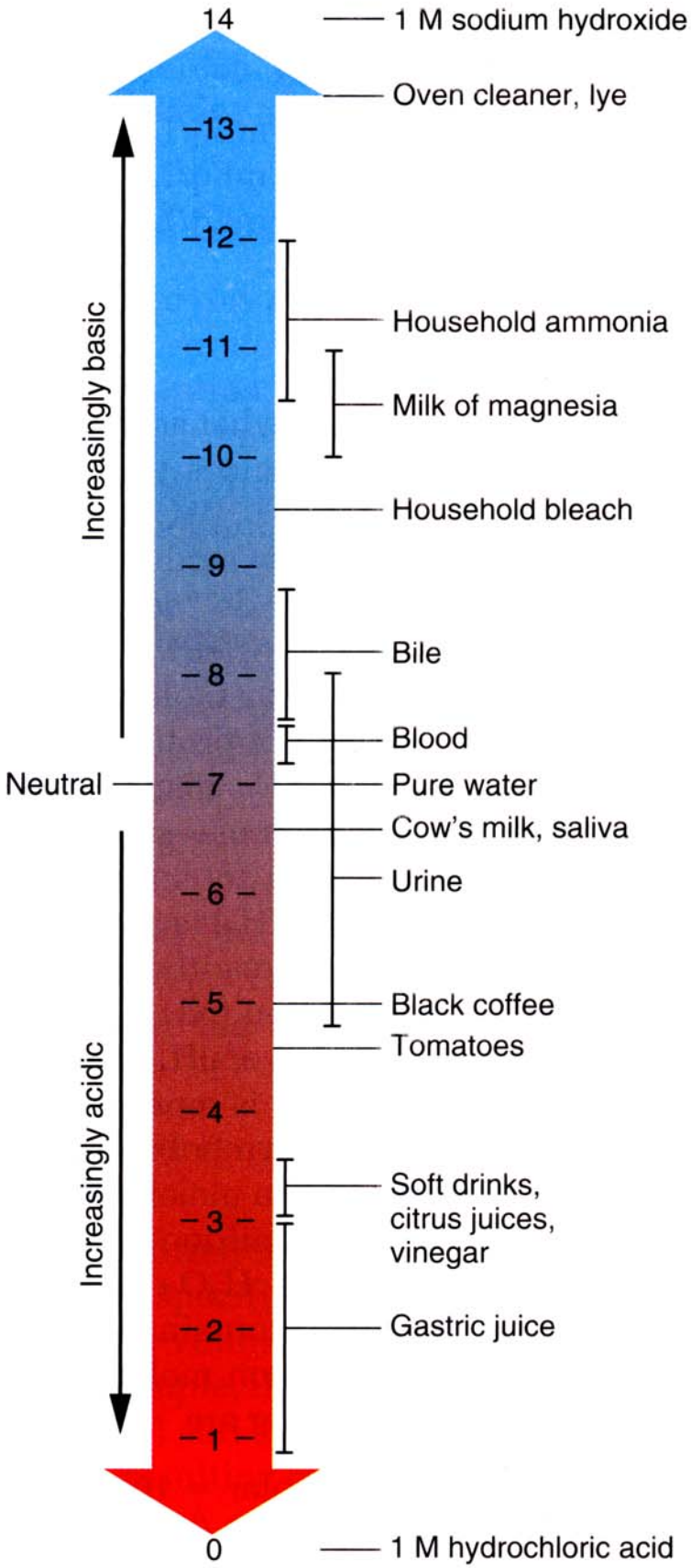
The pH of a solution can extend from a value of 0 to 14. A pH of 7 is considered neutral. A value below 7 is considered acidic and a value above 7 is considered basic (alkaline). A change in 1 pH unit represents a profound change in the state of the fluid under measure. A solution that has a pH value of 5 is 10 times more acidic than a solution with a pH value of 6. Thus even small changes in pH values can have a profound effect on biological processes. In other words, a pH of 6.1 is a relatively major change from a pH of 6.2.



pH is shorthand for the concentration of H^+ ions (protons or hydrogen ions) in a solution. Pure water has an equal concentration of H^+ and OH^- ions in solution, and is therefore considered a neutral solution with a pH of 7. There are 1×10^{-7} moles per liter of H^+ ions in pure water and an equal concentration of OH^- ions (1×10^-7 moles per liter). A solution that has a concentration of 1×10^{-4} moles per liter of H^+ ions has a pH of 4 and a solution that has 1×10^{-2} moles per liter of H^+ ions has a pH of 2.

When an acid is added to a solution it releases H^+ ions and increases the concentration of H^+ ions in solution, making the solution more acidic. A good acid is hydrochloric acid (HCl). In contrast, a base adds OH^- ions to a solution and makes the solution more alkaline or basic. A good base is the chemical sodium hydroxide (NaOH).

pH is important for the functionality of biological systems. Cells and organs lose functionality if pH changes dramatically. Many proteins and enzymes in the body lose functionality in an acidic or basic environment. In our bodies, the ideal pH for most biological processes is pH 7.4. An acidic environment results in H^+ binding to sites on the proteins and causing loss of functionality or structure.



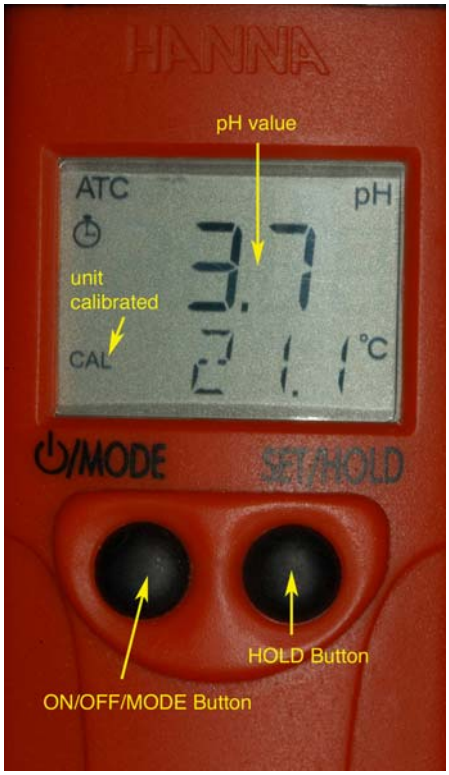
INSTRUMENTATION:

The pH pens consists of a glass enclosed electrode that consists of a H^+ permeable glass end-bulb that is exposed to the aqueous solutions being measured. As the H^+ move across the glass into the fluid filled internal cavity of the electrode, a chemical reaction occurs that results in the generation of a voltage that is converted by the electronics into a pH value on the display screen.

INSTRUCTIONS:

To use the pH Pen:

1. Remove the protective black plastic end-cap with a gentle downward pull. If the pen has not been used for a long time place in water for 30-60 min **before** attempting to do measurements.



2. Press the ON/OFF/MODE button for 3 sec. You will see a % value and the word BATT. This informs you about the status of the batteries that power the unit. The unit has been previously calibrated and you will see the word cal in the lower left corner of the screen.
3. Place the end of the pen in the solution of interest and gently stir the end of the pen in the solution for 20 sec or so. Both the pH and the temperature of the solution will be displayed.
4. In order to freeze the pH value in memory, press the SET/HOLD button for 2-3 sec until the word HOLD appears at the bottom of the screen (do not remove the pen from the solution until the word HOLD appears).
5. In order to get another measurement, press either of the 2 buttons to clear the memory and return the until to measurement mode.