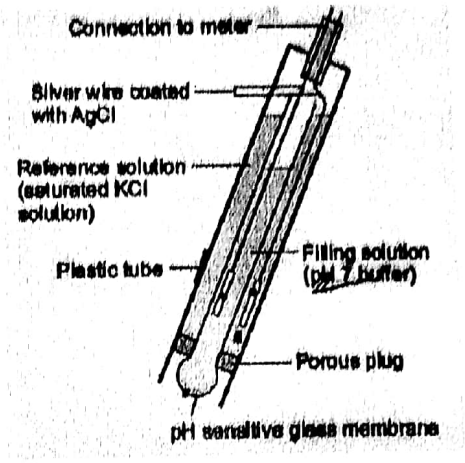
Aim: To learn the use of pH meter for adjusting the pH of a solution/buffer

Background: All living processes are dependent on ionizing solvents. Similarly most chemical reactions occur in aqueous solution (that is basically providing H^+ and OH^- ions). Arrhenous introduced the concept of dissociation of electrolytes and Sorrenson demonstrated the importance of H^+ in enzymatic activity and also coined the term pH about a century ago. Three parameters are involved in the pH measurement: the actual molar concentration of hydrogen ions, the dissociation constant of the acid (pKa), and temperature.

pH is defined as the negative of the logarithm to the base 10 of the hydrogen ion concentration ($pH = -\log_{10}[H^+]$).

Electrode: Two electrodes of silver or platinum with silver lining: one is a reference electrode and another is an indicator electrode. Both have an electrolyte solution of 0.1-1M KCl of known concentration as it reaches its equilibrium potential more quickly. The pH measuring electrode is a hydrogen ion sensitive glass bulb.

How does a pH meter works: The range of measurement is from 1-14. Towards the range, it tends to be non-linear. Indicator electrode is immersed in the solution containing H^+ and the potential difference between indicator and reference electrode is measured by a very sensitive voltmeter. The voltage output from the electrode changes linearly in relation to pH and the temperature. Some equipments use thermostable electrodes.



http://www.pharmaguideline.com/2015/08/principle-and-working-of-pH-probes.html

How to calibrate a pH meter before use. (Note: The calibration has already been done for the pH meter you would be using. So you do not have to calibrate it. That means you do not have to perform steps 1-4)

1. Standard solutions for calibrating the pH meter. There are usually three standard solutions for calibration of pH meters. These are at pH 4, 7, and 10.
2. Remove pH meter probe from storage vial that has an electrode storage solution (usually 3MKCl) and rinse with distilled water squirt bottle. Gently blot with kimwipe. **Do not let probe dry out in air any time.**
3. Place probe in the 4 standard solution and press "Standardize." Wait until screen flashes 4.00. This means the pH meter has finished calibrating with this solution.
4. Repeat step 3 with the 10 and 7 standard solutions, rinsing between each solution with distilled water and blotting with clean tissue paper.
5. Prepare the solution that has been designated for your groups in the instruction sheet **but do not make up the final volume yet.**
6. Place probe in your **solution** that has a magnetic bead in it. When the meter stops drifting, it has reached a stable reading.
7. While placing pH meter probe into the solution, make sure that the end of the probe is submerged, but not the entire probe. Avoid mixing the solution while probe is still in the solution as the magnetic bead could break the probe.
8. If you need the solution to be more acidic, add diluted HCl (0.1N) slowly. If you need the solution to be more basic, add diluted NaOH (0.1N) slowly. When you prepare a buffer that has one acidic salt and one basic salt, the concentrated solutions of these salts should be used for decreasing or increasing the pH. **(Why???)**
9. When finished, rinse probe and blot. Return to storage vial (make sure there is still enough pH electrode storage solution in the vial to cover end of probe).

Some other points to consider: *3-4M KCl and/or pH 4 buffer provide good conditions for mold to grow. To prevent mold from growing in storage solutions, use up to 4% of sodium benzoate or azide in the reference fill and storage solutions.*

Exercise: All groups have to make a 100ml of aqueous solution of 0.3M NaCl and then adjust its pH to:

Gp 1: 5.00
Gp 2: 4.50
Gp 3: 4.44
Gp 4: 4.00
Gp 5: 4.04
Gp 6: 3.89
Gp 7: 3.67
Gp 8: 3.56
Gp 9: 3.14
Gp 10: 3.01

Show initial value and the final value in you observations