pH and pH meter

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pH

- pH is a unit of measure which describes the degree of acidity or alkalinity (basic) of a solution.
- It is measured on a scale of 0 to 14.
- The formal definition of pH is the negative logarithm of the hydrogen ion activity.
- pH = -log[H+]

pH value

- The pH value of a substance is directly related to the ratio of the hydrogen ion and hydroxyl ion concentrations.
- If the H+ concentration is higher than OH- the material is acidic.
- If the OH- concentration is higher than H+ the material is basic.
- 7 is neutral, < is acidic, >7 is basic

The pH scale

- The pH scale corresponds to the concentration of hydrogen ions.
- If you take the exponent of the H3O+ concentrations and remove the negative sign you have the pH of the solution.
- For example pure water H+ ion concentration is 1 x 10^-7 M, therefore the pH would then be 7.

pH

- The addition of acid to water increases the concentration of hydrogen ions and reduces the concentration of hydroxyl ions
- The addition of a base would increase the concentration of hydroxyl ions and decrease the concentration of hydrogen ions

Acids and Bases

- An acid can be defined as a proton donor, a chemical that increases the concentration of hydrogen ions in solution.
- A base can be defined as a proton acceptor, a chemical that reduces the concentration of hydrogen ions in solution.

pH Measurement

- A pH measurement system consists of three parts: a pH measuring electrode, a reference electrode, and a high input meter.
- The pH measuring electrode is a hydrogen ion sensitive glass bulb.
- The reference electrode output does not vary with the activity of the hydrogen ion.

pH Meter

- A sample is placed in a cup and the glass probe at the end of the retractable arm is placed in it.
- The probe is connected to the main box.
- There are two electrodes inside the probe that measure voltage.
- One is contained in liquid with fixed pH.
- The other measures the acidity of the sample through the amount of H+ ions.

pH Meter

- A voltmeter in the probe measures the difference between the voltages of the two electrodes.
- The meter then translates the voltage difference into pH and displays it on the screen.
- Before taking a pH measurement the meter must be calibrated using a solution of known pH.

Temperature and Buffers

- Temperature compensation is contained within the instrument because pH electrodes are temperature sensitive.
- Temperature compensation only corrects for the change in the output of the electrode, not for the change in the actual solution.
- Buffers are solutions that have constant pH values and the ability to resist changes in pH.
- They are used to calibrate the pH meter.