MILANCO INDUSTRIAL CHEMICALS

BASIC CHEMISTRY PART II

TITRATION AND pH

In our first lesson, we learned that acids and bases react together in a reaction we call neutralization. This is the reaction we are applying when we use our titration kit.

By using a set sample size, we can determine the concentration of that sample if we accurately measure the amount of titrating (neutralizing) solution required to neutralize the sample. The drops of a titrating solution are a good measure because drops are relatively consistent in size. We can also use milliliters if using a dilute titrating solution. If the product is alkaline (base) we use an acid; if the product is acid we use a base titrating solution. Alkaline, for example, requires an acid titrating solution while the acid require an alkaline titrating solution. In order to see when the point of neutralization has been reached, an internal indicator is used. The indicators are organic substances which change color at a particular pH.

The ***pH*** of a solution reflects the intensity of an acid or a base. The pH scale runs from 0 to 14. The neutral point is 7. Any pH *below 7* is acidic and pH *above 7* is alkaline. The closer the acid pH is to "O", the more intense is the acid. The closer the alkali (base) pH is to 14, the more intense is the base.

pH SCALE	0 1 2 3	4 5 6	7	8 9 10	11 12 13 14
	STRONG ACID	WEAK ACID	NEUTRAL	WEAK BASE	STRONG BASE

The ***pH*** is a measure of the intensity of the acid or the base and cannot be used as a measure of the amount or concentration of an acid or a base. The reason pH cannot be used as a measure of concentration is that it is a "logarithmic function". Don't let this phrase throw you, because all it means is that each unit of change is ten times the previous unit. For example, if it takes one pint of a given acid to bring neutral water to a pH of 6, it will take ten pints of the same acid to bring the solution to a pH of 5. You can see the most rapid pH change occurring near 7.

Different acids and bases have different strengths and consequently different pH's for the same concentration. In other words, there are weak and strong acids and bases. Vinegar (acetic acid) is a weak acid and muriatic acid (hydrochloric acid) is a strong acid. Bicarbonate of soda is a weak base and sodium hydroxide (caustic soda) is a strong base.

Earlier we talked about internal pH indicators which are added into the sample. The most common ones that we use are phenolphthalein and bromophenol blue. Phenolphthalein changes from colorless in acid to pink in alkaline solutions at a pH of 8.3. While the change is not exactly at 7, the change in pH is so rapid at this range that we can use it. The vivid color change makes it the most widely used indicator.

Bromophenol blue changes color from yellow in strong acid to blue at a pH of 4. This gives us a good indicator for determining strong acid, usually referred to as the active acid content. When measuring an alkaline solution by titration, this point (using bromophenol blue) measures total alkalinity.

There are also external pH indicators which are used. The most common is a pH meter. The pH meter must be calibrated in the range of the solution being tested.