Chemistry 201

Titrations
Definition of pH

NC State University

Titrations

A stoichiometric amount of reactant (titrant) is added to a known volume of an analyte. One standard type is an acid-base titration. In this case, the titrant is often dispensed using a buret.

The stopcock of the buret can be opened to permit a known volume to flow into the analyte solution.
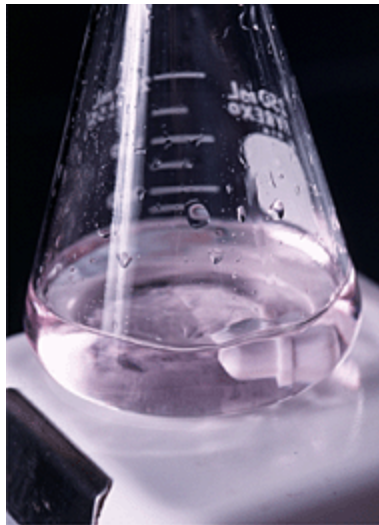
Endpoint indicator

In an acid-base titration one uses an indicator dye to give a visual signal that the titration end point has been reached. For example, a frequent application is the neutralization of an acid or base. In that case, the endpoint occurs when the solution has reached pH 7.

Colorless solution.   Equivalence (pink)   Gone too far.

Definitions

pH is minus log to base 10 of $[H^+]$.

$pH = -\log_{10}([H^+])$

Recall that $K_w = [H^+][OH^-] = 10^{-14}$, so $pK_w = ?$

We can also define

$pOH = -\log_{10}([OH^-])$

Definitions

$K_w = [H^+][OH^-] = 10^{-14}$ and $pK_w = 14$

Therefore, $pK_w = pH + pOH$

This is useful if we are given pH and we wish to calculate $[OH^-]$.

Of course, when a solution is neutral $[H^+] = [OH^-]$ or pH = pOH = 7.

Detecting acidity in lakes

Lakes in Sweden that are on granite have little buffering capacity, and are therefore often acidic. An water quality chemist will titrate the solution to determine the [H^+] concentration. If 20 mL of a pH 10 solution is added to 100 mL of lake water before the equivalence point is reached calculate [H^+].

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pH = -log([H^+]) = -log(2 x 10^{-5}) = 4.7