

Johnstone Laboratory Resource

Concentrations of Aqueous Acid and Base Solutions

Many laboratory reagents are commonly supplied as aqueous solutions in “concentrate form” with the concentration provided as a wt%. This situation most commonly arises because of how these reagents are prepared. For instance, no one probably wants an $\text{HCl}_{(\text{aq})}$ solution that is specifically at 37 wt% (12.18 M), but this is the highest concentration that is readily obtainable by dissolving $\text{HCl}_{(\text{g})}$ in water under ambient conditions. Note that higher concentrations are possible. Below are the molar concentrations of common “concentrated” aqueous reagents whose concentrations are usually specified in wt% along with the densities used to calculate those concentrations.

Reagent	wt%	Density	Molarity
HCl	37%	1.18	12.2
HF	49%	1.19	28.9
HNO_3	70%	1.41	15.6
H_3PO_4	85%	1.71	14.8
HClO_4	70%	1.67	11.7
H_2SO_4	98%	1.84	18.4
NH_3	25%	0.91	13.4
NH_3	28%	0.90	14.5
NH_3	35%	0.88	18.1
$\text{H}_2\text{O}_2^{**}$	30%	1.45	9.8

** Care should be taken with all of these concentrations because the wt% of these reagents as supplied is often approximate. Particular care should be taken with H_2O_2 because it decomposes slowly over time.