Chemical Properties

pH

Aqua ammonia (ammonium hydroxide) is classified as a weak base. It ionizes much less completely in water than does a strong base such as sodium hydroxide. This is reflected in the pH's normally encountered with solutions of ammonia. Typically, the pH of an ammonia solution will be between 11 and 12, compared with a pH of about 14 for sodium hydroxide solutions. The theoretical pH's below are for ammonia in pure water at 77°F.

Wt.%			
NH_3	***Normality***	***pH***	***%Ionized***
17.0	10.0	12.1	
1.7	1.0	11.6	0.42
0.17	0.1	11.1	1.33
0.017	0.01	10.6	4.15
0.0017	0.001	10.1	12.52

Dissociation

Dissociation Constants (Kb's) of Aqua Ammonia From 0°C to 50°C

Temperature °C	***pKb***	***Kb***
0	4.862	1.374×10^{-5}
5	4.830	1.479×10^{-5}
10	4.804	1.570×10^{-5}
15	4.782	1.652×10^{-5}
20	4.767	1.710×10^{-5}
25	4.751	1.774×10^{-5}
30	4.740	1.820×10^{-5}
35	4.733	1.849×10^{-5}
40	4.730	1.862×10^{-5}
45	4.726	1.879×10^{-5}
50	4.723	1.892×10^{-5}

±0.005, determined by emf method by R.G. Bates and G.D. Pinching

Note: pKb = pKw-pKa

where pKw = 14 and pKa = $[H+]\{NH_3\}/[NH4+]$

Heat of Solution

When liquid anhydrous ammonia is dissolved in water, heat is liberated which varies with the final concentration of aqua ammonia produced.

Final Wt % NH_3	***BTU/lb. NH3***
10.0	343.8
20.0	328.5
30.0	308.2
40.0	270.0
50.0	218.8

Reactivity

Aqua ammonia will react with many organic and inorganic acids to form ammonium salts and compounds; with certain metals to form complex-ion salts; with halogens to form haloamines (such as its reaction with sodium hypochlorite [bleach] to form toxic chloramines); and under extreme circumstances with silver and mercury to form explosive azides.

Aqua ammonia corrodes copper (and copper-containing alloys such as brass), zinc, cadmium and silver.

For chemical corrosivity information, see the Materials Compatibility section on page 6.

Physical Properties

Aqua ammonia is a clear, colorless liquid having a strong pungent ammonia odor.

Specific Gravity

The specific gravity of aqua ammonia is customarily expressed as its density at 60°F compared to the density of water at 60°F. Comprehensive tables of specific gravity, as well as corrections to use for temperature variations, are presented on pages 16-20 in Appendix A.