Taste and Understand Acid Additions

I. History

A. Robert Boyle
   1. Acids: Taste sour, corrode metal, change litmus paper red, becomes less acid when mixed with bases.
   2. Bases: Feel slippery, change litmus paper blue, becomes less basic when mixed with acids.

B. Svante Arrhenius
   1. Water can dissolve compounds
      a. Acids give off a hydrogen ion (H^+)
      b. Bases give off a hydroxide ion (OH^-)
   2. Neutralization
      a. Water
      b. Salt

C. Johannes Bronsted and Thomas Lowry
   1. Acid: Any substance that gives off a hydrogen ion
   2. Base: Any substance that can accept a hydrogen ion

II. Acid

A. Grapes
   1. Tartaric Acid
      a. Most abundant acid in grapes
      b. Partially consumed during primary fermentation
   2. Malic Acid
      a. Second most abundant acid in grapes
      b. Mostly consumed during malolactic fermentation
      c. Converted to Lactic acid during malolactic fermentation
   3. Citric Acid
      a. Trace amount, mostly used for internal functions of the grape
      b. Broken down and consumed during malolactic fermentation once Malate is gone

B. Titratable Acidity
   1. Measures the total amount of acid in the grape juice / wine (g/L)
   2. Effects the overall taste and composition of the wine

III. pH

A. Effects growth of undesirable bacteria and yeast
B. Greater sulfur dioxide anti-oxidant/anti-microbial activity
C. Impacts oxidation rates
D. Favors longer ageing potential
E. Measures the total amount of hydrogen ions (H^+)
F. pH = -log[H^+]

Strong Acid	1.00E+00	1.0	0	0.00000000000001	1.00E-14
	1.00E-01	0.1	1	0.0000000000001	1.00E-13
	1.00E-02	0.01	2	0.000000000001	1.00E-12
	1.00E-03	0.001	3	0.00000000001	1.00E-11
	1.00E-04	0.0001	4	0.0000000001	1.00E-10
Weak Acid	1.00E-05	0.00001	5	0.000000001	1.00E-09
	1.00E-06	0.000001	6	0.00000001	1.00E-08
Neutral	1.00E-07	0.0000001	7	0.0000001	1.00E-07
	1.00E-08	0.00000001	8	0.000001	1.00E-06
Weak Base	1.00E-09	0.000000001	9	0.00001	1.00E-05
	1.00E-10	0.0000000001	10	0.0001	1.00E-04
	1.00E-11	0.00000000001	11	0.001	1.00E-03
	1.00E-12	0.000000000001	12	0.01	1.00E-02
	1.00E-13	0.0000000000001	13	0.1	1.00E-01
Strong Base	1.00E-14	0.00000000000001	14	1.0	1.00E+00

Base

14	Drain-O & Sodium Hydroxide
13.8	Oven Cleaner
13.05	Bottle washing (process midpoint)
12.6	Bleach
12.4	Lime, saturated
12	Photographic Developer
11.6	Ammonia, N
10	Milk of Magnesia & Great Salt Lake
9.2	Borax
8.4	Sodium bicarbonate
8	Egg white & Sea water
7.3-7.5	Blood, Human
7	Pure water
6	Milk
5	Cottage cheese & Black Coffee
4.0-5.0	Beer
4	Acid Rain & Tomatoes
3.0-4.0	Oranges
3.5	Pickling
2.8-3.8	Wines
3	Coca-Cola
2.8-3.0	Vinegar
2	Limes & Lemons
0.8	Hydrochloric (Stomach) Acid
0.3	Sulfuric, Nitric, & Battery Acids

Acid