Acids and bases reference sheet





 





**R-44**

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| **STRONG ACIDS** |
| **Acid** | **Formula** | **Conj. Base** | **Ka** |
|  Perchloric  |  HClO4  |  ClO4-  |  Very large  |
|  Hydriodic  |  HI  |  I-  |  Very large  |
|  Hydrobromic  |  HBr  |  Br-  |  Very large  |
|  Hydrochloric  |  HCl  |  Cl-  |  Very large  |
|  Nitric  |  HNO3  |  NO3-  |  Very large  |
|  Sulfuric  |  H2SO4  |  HSO4-  |  Very large  |
|  Hydronium ion  |  H3O+  |  H2O  |  1.0  |



**You can convert back and forth from
Ka to Kb using this equation:

Kw = Ka x Kb**

**Strong Acid** $→$ **Weak Conj. Base**

 **Large Ka Small Kb**

**Weak Acid** $→$ **Strong Conj. Base
 Small Ka Large Kb**

**Strong Base** $→$ **Weak Conj. Acid**

 **Large Kb Small Ka**

**Weak Base** $→$ **Strong Conj. Acid**

 **Small Kb Large Ka**

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| **COMMON WEAK ACIDS** |
| **Acid** | **Formula** | **Conj.Base** | **Ka** |
|  Iodic  |  HIO3  |  IO3-  |  1.7 x 10-1 |
|  Oxalic  |  H2C2O4  |  HC2O4-  |  5.9 x 10-2 |
|  Sulfurous  |  H2SO3  |  HSO3-  |  1.5 x 10-2 |
|  Phosphoric  |  H3PO4  |  H2PO4-  |  7.5 x 10-3 |
|  Citric  |  H3C6H5O7  |  H2C6H5O7-  |  7.1 x 10-4 |
|  Nitrous  |  HNO2  |  NO2-  |  4.6 x 10-4 |
|  Hydrofluoric  | HF  |  F-  |  3.5 x 10-4 |
|  Formic  |  HCOOH  |  HCOO-  |  1.8 x 10-4 |
|  Benzoic  |  C6H5COOH  |  C6H5COO-  |  6.5 x 10-5 |
|  Acetic  |  CH3COOH  |  CH3COO-  |  1.8 x 10-5 |
|  Carbonic  |  H2CO3  |  HCO3-  |  4.3 x 10-7 |
|  Hypochlorous  |  HClO  |  ClO-  |  3.0 x 10-8 |
|  Hydrocyanic  |  HCN  |  CN-  |  4.9 x 10-10 |



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| **COMMON WEAK BASES** |
| **Base** | **Formula** | **Conj. Acid** | **Kb** |
| Ammonia  |  NH3 |  NH4+ |  1.8 x 10-5 |
|  Methylamine |  CH3NH2 |  CH3NH3+ |  4.38 x 10-4 |
|  Ethylamine |  C2H5NH2 |  C2H5NH3+ |  5.6 x 10-4 |
|  Diethylamine |  (C2H5)2NH |  (C2H5)2NH2+ |  1.3 x 10-3 |
|  Triethylamine |   (C2H5)3N |   (C2H5)3NH+ |  4.0 x 10-4 |
|  Hydroxylamine |  HONH2  |  HONH3+  |  1.1 x 10-8 |
|  Hydrazine | H2NNH2  | H2NNH3+  |  3.0 x 10-6 |
|  Aniline |  C6H5NH2  |  C6H5NH3+  |  3.8 x 10-10 |
|  Pyridine |  C5H5N  |  C5H5NH+   |  1.7 x 10-9 |

Weak Acids and Bases Calculations

* Dissociation is a reversible reaction!
* So use Equilibrium Expressions, K values, and Ice Tables to find [ ]’s before doing pH type calculations
* Equilibrium Expression still$\frac{Products}{Reactants }$which will be$\frac{[Dissociated Ions]}{[Undissociated Molecule]}$
* To find pH (or pOH) of something you first have to know the [H3O+] (or [OH-] )
	+ For weak acids/bases you need to do the following steps to find those [ ]’s
		- Step 1 – ICE Table
		- Step 2 – Write a Ka expression (or Kb depending on the problem)
		- Step 3 – Solve for x using either quadratic or 5% rule
		- Step 4 – put x back into ICE Table to find the actual [ ] answers
		- Step 5 – use your [H3O+] (or [OH-] ) to find the pH (or pOH)

Monoprotic VS. PolyPROTIC – HOW MANY IONS COME OFF?

* Monoprotic acids/bases 🡪 only have one H+ or OH-
* Diprotic acids/bases 🡪 have two H+ or OH-
* Triprotic acids/bases 🡪 have three H+ or OH-

* Strong Bases
	+ all OH- come off
		- Take that into account with your stoichiometry when finding the [OH-]
			* 1 M Ca(OH)2 = 2 M of OH- ions
* Strong Acids
	+ The first H+ comes off and it would be a normal strong acid type pH calculation
		- No Ka value needed
		- No ICE Table needed.
	+ The second/third/etc H+ might come off BUT
		- That would be a weak reaction and you would need:
			* Ka value for that second H+ coming off
			* Would need to do an ICE table
			* Then add the [H+] from the ICE Table calculation to the [H+] you found from the first H+ coming off.
	+ Example: H2SO4 🡪 H+ + HSO4-Only assume one H+ comes off unless given Ka value for HSO4- 🡪 H+ + SO42-
* Weak Acids/Bases
	+ For the given Ka or Kb value assume only one H+/OH- comes off.
	+ You would need a second Ka or Kb value to do a second ICE Table for the second H+/OH- coming off, and then would need to add your [ ]’s from each ICE Table calculation.