**Acids and Bases – Formula Sheet:**

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| **Arrhenius Definition:*** Acids produce H+ ions in solutions.
* Bases produce OH- ions in solutions.

**Bronsted-Lowry Definition:*** Acids are proton donors.
* Bases are proton acceptors.

**Lewis Definition:*** Acids are electron pair acceptors.
* Bases are electron pair donors.
 | **Acid-Base Equations: (0.1 M HCl or 0.15M KOH)** |
| **Strong Acids:**HCl / HBr / HI / HNO3 / HClO4 / H2SO4**Weak Acids:**HF / HNO2 / HClO / HCN / HC2H3O2 **Strong Bases:** NaOH / KOH **Weak Bases**: NH3 | **Autoionization of Water:** |
| **pH of a Weak Base: (0.25 M NH3)**If < 1 x 10-4, then  | **pH of a Weak Acid: (0.5M HC2H3O2)**If **Ka** < 1 x 10-4, then  |
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| **Acidic Ions:** | **Neutral Ions:** | **Weak Basic Ions:** |
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**Strong Base Ions:**  | **Percent Ionization for Acids:****Percent Ionization for Bases:** |

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| **Acid:** | **Ka Value:** |
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 | **Acid-Base Dissociation Constant Equations:** |
| **Note:** A buffer solution is made up of a weak acid and its conjugate weak base. Buffer solutions resist changes to its pH.**Examples of Buffer Solutions:**1. HF / NaF
2. NH4Cl / NH3
3. HC2H3O2 / NaC2H3O2
 | **pH - Buffer Solution**: **(0.5M NH4Cl / 0.4M NH3)**Henderson-Hasselbalch Equation:**Note:**  |
| **Dissociation Constants for H3PO4**

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**Note:** The 1st step is most important for calculating the pH of the solution: | **pH of a Polyprotic Acid:** **(0.25M H3PO4)**------------------------------------------------------------- |
| **Amphoteric Ion Reactions in Water:** | **pH of an Amphoteric Salt:** **(0.4M NaH2PO4)** |

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| **Standard Form of a Quadratic Equation:****The Quadratic Formula:****Dilution Formula:****Moles:** | **pH of a Weak Acid / Weak Base Salt**: **(0.2M NH4F)** |
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| **Titration:** | **pH at Equiv. point** |
| Strong Acid – Strong Base | pH = 7 |
| Weak Acid – Strong Base | pH > 7 |
| Weak Base – Strong Acid | pH < 7 |

 | **Acid-Base Titrations:*** ICE Tables – Use Molarity
* BCA Tables – Use Moles

**At ½ Veq (Equivalence Volume):** |
| **Acid-Base Indicators:**

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| **Indicator:** |  |  |  |
| **Methyl Orange** |  |  |  |
| **Methyl Red** |  |  |  |
| **Bromthymol Blue** |  |  |  |
| **Phenolphthalein** |  |  |  |

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