

Acids and Bases



Acid and Base Definitions

- ◆ An *Arrhenius acid* is a chemical compound that increases the concentration of hydrogen ions, H^+ , in aqueous solution.
- ◆ An *Arrhenius base* is a substance that increases the concentration of hydroxide ions, OH^- , in aqueous solution.

Properties of Acids

- ◆ Aqueous solutions of acids have a sour taste.
- ◆ Acids change the color of acid-base indicators.
- ◆ Some acids react with active metals and release hydrogen gas, H_2 .
 - ◆ $\text{Ba(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{BaSO}_4\text{(s)} + \text{H}_2\text{(g)}$
- ◆ Acids react with bases to produce salts and water.
- ◆ Acids conduct electric current.

Some Acids

- ◆ Sulfuric Acid
 - ◆ Sulfuric acid is the most commonly produced industrial chemical in the world.
- ◆ Nitric Acid
 - ◆ Used to produce fertilizers
- ◆ Phosphoric Acid
 - ◆ rust inhibitor, food additive, dental and orthopedic etchant
- ◆ Hydrochloric Acid
 - ◆ Concentrated solutions of hydrochloric acid are commonly referred to as muriatic acid.
 - ◆ Used in producing PVC, descaling, gelatin production and leather processing
- ◆ Acetic Acid
 - ◆ Pure acetic acid is a clear, colorless, and pungent-smelling liquid known as glacial acetic acid.
 - ◆ The active ingredient in vinegar

Bases

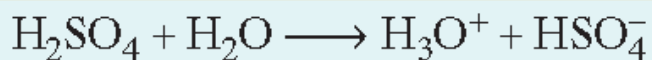
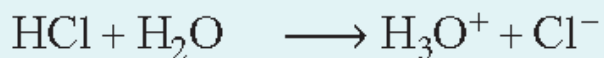
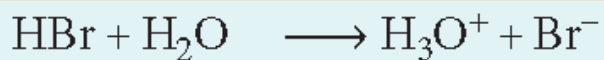
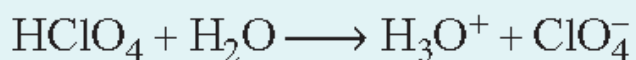
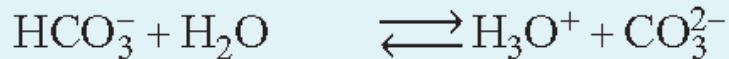
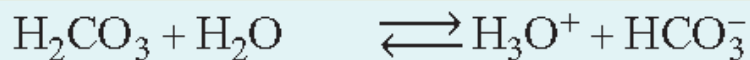
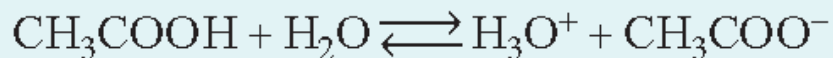
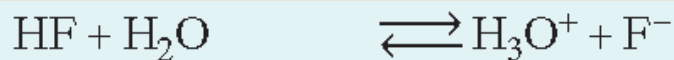
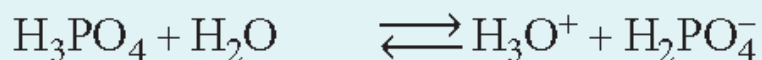
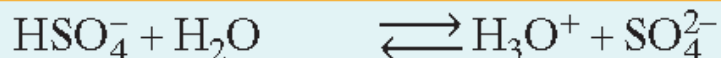
- 💧 Aqueous solutions of bases taste bitter.
- 💧 Bases change the color of acid-base indicators.
- 💧 Dilute aqueous solutions of bases feel slippery.
- 💧 Bases react with acids to produce salts and water.
- 💧 Bases conduct electric current.

pH

- 💧 pH is the measure of the $-\log$ of the H^+ Ion concentration in solution.
- 💧 Because it is the $-\log$, the higher the concentration, the lower the number
- 💧 The pH Scale goes from 0-14
- 💧 pH of 7 is neutral
 - 💧 Less than 7 is acidic
 - 💧 Greater than 7 is basic

Strong Acids vs. Weak Acids

- A strong acid is one that ionizes completely in aqueous solution.
 - a strong acid is a strong electrolyte
 - HClO_4 , HClO_3 , HCl , HNO_3 , HBr , HI , H_2SO_4
- A weak acid releases few hydrogen ions in aqueous solution.
 - hydronium ions, anions, and dissolved acid molecules in aqueous solution
 - HCN
 - Organic acids (—COOH), such as acetic acid

Strong acids**Weak acids**

Neutralization Reactions

- ◆ Acid – Base Reactions that have equal amounts of the H_3O^+ and OH^- Ions
- ◆ They produce H_2O and a Salt



List of Strong Acids and Bases

Strong Acids		Strong Bases	
HCl	Hydrochloric	NaOH	
HBr	Hydrobromic	KOH	
HI	Hydroiodic	RbOH	
H ₂ SO ₄	Sulfuric Acid	CsOH	
HNO ₃	Nitric Acid	Ca(OH) ₂	
HClO ₄	Perchloric Acid	Sr(OH) ₂	
HClO ₃		Ba(OH) ₂	

Self ionization of water

- 💧 Water can dissociate too!
- 💧 The normal dissociation for water is 0.0000001M H^+

pOH

- ◆ pOH is the measure of the $-\log$ of the OH^- Ion concentration in solution.
- ◆ $\text{pOH} + \text{pH} = 14$
- ◆ Because it is the $-\log$, the higher the concentration, the lower the number
- ◆ The pOH Scale goes from 0-14
- ◆ pOH of 7 is neutral
 - ◆ Less than 7 is basic
 - ◆ Greater than 7 is acidic