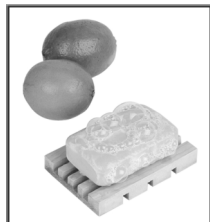


Intro to Acids & Bases



Properties of Acids & Bases

- Acids

- _____
- _____

- Bases

- _____
- _____
- _____

Ions in Solution

- _____ **solutions** – contain more H^+ than OH^-
- _____ **solutions** – contain more OH^- than H^+
- _____ **solutions** – contain equal amounts of H^+ and OH^-

Arrhenius Model of Acids & Bases

- _____ : a substance that contains H and ionized to produce H^+ when dissolved in water.
- _____ : a substance that contains OH and ionizes to produce OH^- when dissolved in water

Bronsted-Lowry Model

- _____ : proton donor
- _____ : proton acceptor

Bronsted-Lowry Model

- _____ – the species produced when a base accepts the H^+ ion from the acid
- _____ – the species produced when the acid gives up its H^+

Conjugate Acids & Conjugate Bases

- Identify the acid, base, conjugate acid, and conjugate base of the following reaction...
- $HX + H_2O \leftrightarrow H_3O^+ + X^-$

Conjugate Acids & Conjugate Bases

- Identify the acid, base, conjugate acid, and conjugate base of the following reaction...
- $NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$

Conjugate Acids & Conjugate Bases

- _____ – substance that can act as either an acid or a base

Conjugate Acids & Conjugate Bases

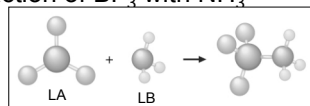
- Identify the acid, base, conjugate acid, and conjugate base of the following reactions...
- $\text{NH}_4^+ + \text{OH}^- \leftrightarrow \text{NH}_3 + \text{H}_2\text{O}$
- $\text{HBr} + \text{H}_2\text{O} \leftrightarrow \text{H}_3\text{O}^+ + \text{Br}^-$

Conjugate Acids & Conjugate Bases

- What are the conjugate bases of the following acids?
- $\text{HCl} \rightarrow$
- $\text{H}_2\text{SO}_4 \rightarrow$
- What are the conjugate acids of the following bases?
- $\text{BrO}_2^- \rightarrow$
- $\text{NH}_3 \rightarrow$

Lewis Acids & Bases

- _____ – e- pair acceptor
- _____ – e- pair donor
- Reaction of BF_3 with NH_3



- BF_3NH_3

Models for Acids & Bases

TABLE 14.10 Three Models for Acids and Bases

Model	Definition of Acid	Definition of Base
Arrhenius	H ⁺ producer	OH ⁻ producer
Brønsted-Lowry	H ⁺ donor	H ⁺ acceptor
Lewis	Electron-pair acceptor	Electron-pair donor

Monoprotic & Polyprotic Acids

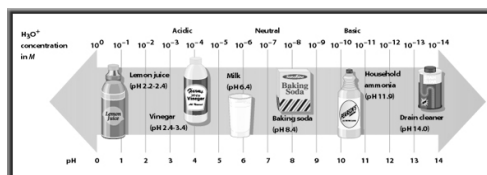
- _____ – an acid that can only donate 1 H⁺ ion
- _____ – acids that can donate more than one H⁺ ion

The pH Scale

- _____ - mathematical scale in which the concentration of hydronium ions in a solution is expressed as a number from 0 to 14.

Interpreting the pH Scale

- pH of 7 is neutral. A pH less than 7 is acidic, and a pH greater than 7 is basic.



pH and pOH

- The **pH** of a solution equals the negative logarithm of the hydrogen ion concentration

$$\text{pH} = -\log [\text{H}^+]$$

pH and pOH

- Calculate the pH of a solution whose $[\text{H}^+]$ is $1.0 \times 10^{-2} \text{ M}$

More Examples

- Calculate the pH of a solution whose $[\text{H}^+]$ is $3.0 \times 10^{-6} \text{ M}$
- Calculate the pH of a solution whose $[\text{H}^+]$ is $8.2 \times 10^{-6} \text{ M}$

More Formulas

$$\text{pH} + \text{pOH} = 14$$

$$\text{pH} = -\log [\text{H}^+]$$

$$\text{pOH} = -\log [\text{OH}^-]$$

$$[\text{H}^+] = \text{antilog} - \text{pH}$$

$$[\text{OH}^-] = \text{antilog} - \text{pOH}$$

$$[\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$$

Examples

- Calculate the pH, pOH, & $[H^+]$ of the following
- $[OH^-] = 1.0 \times 10^{-6} \text{ M}$

- Calculate the pH, pOH, & $[OH^-]$ of the following
- $[H^+] = 3.6 \times 10^{-9} \text{ M}$

Strong Acids & Bases (I'd know these)

- **Strong Acids**
 1. HCl
 2. HBr
 3. HI
 4. HNO_3
 5. $HClO_3$
 6. $HClO_4$
 7. H_2SO_4
 8. HIO_4
- **Strong Bases**
 - Group 1A & 2A (except Mg & Be) hydroxides

Calculating Solutions of Strong Acids and Bases

- 0.10 M NaOH. Calculate the concentration of all of the ions

Calculating Solutions of Strong Acids and Bases

- Calculate the concentration of all of the ions in $7.5 \times 10^{-4} \text{ M Ca(OH)}_2$
- $Ca(OH)_2 \rightarrow Ca^{+2} + 2OH^-$

Calculating Solutions of Strong
Acids and Bases

- Calculate the pH of a 1.0 M solution of HI

Calculating Solutions of Strong
Acids and Bases

- Calculate the pH of a 0.050 M solution of HNO_3 .

Calculating Solutions of Strong
Acids and Bases

- Calculate the pH of a 2.4×10^{-5} M solution of $\text{Mg}(\text{OH})_2$.

pH of dissolved solids

- Calculate the pH of a solution with 0.566 g of HI dissolved in 0.500 L of solution.

pH of Diluted Solutions

- Calculate the pH of a solution if 10.0 ml of 2.0 M HBr is diluted to 50.0 ml.

Mixtures of Strong Acids

- 54 ml of 0.00125 M HNO_3 is mixed with 25 ml of 0.025 M HCl. What is the pH of the resulting solution?