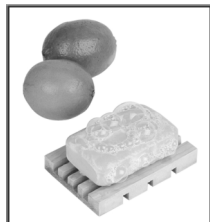


Intro to Acids & Bases



Ions in Solution

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

Autoionization of Water

- $H_2O + H_2O \leftrightarrow H_3O^+ + OH^-$
- Water is the usual solvent for acids and bases
- It produces equal numbers of H_3O^+ 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

Arrhenius Model of Acids & Bases

- HCl

- NaOH

Arrhenius Model of Acids & Bases

- Although the Arrhenius model is useful in describing many acids and bases, it does not describe them all

- For example NH_3 contains no OH^- ions, but it is a base

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...
- $\text{HX} + \text{H}_2\text{O} \leftrightarrow \text{H}_3\text{O}^+ + \text{X}^-$

Conjugate Acids & Conjugate
Bases

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

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?
- HCl →
- H_2SO_4 →
- What are the conjugate acids of the following bases?
- BrO_2^- →
- NH_3 →

Monoprotic & Polyprotic Acids

- _____ – an acid that can only donate 1 H^+ ion
- For example – HCl, HBr, HNO_3 , HClO_4
- _____ – acids that can donate more than one H^+ ion
- For example – H_2SO_4 , H_3PO_4

Complete Ionization

- Write the steps for the complete ionization of H_2Se

Complete Ionization

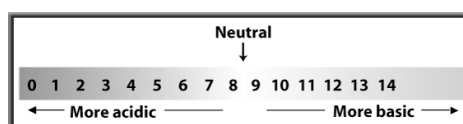
- Write the steps for the complete ionization of H_3AsO_4

The pH Scale

- $[H^+]$ is often expressed in very small numbers.
- _____ is a 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

$$pH = -\log [H^+]$$

pH and pOH

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

More Examples

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

More Formulas

$$pH + pOH = 14$$

$$pH = -\log [H^+]$$

$$pOH = -\log [OH^-]$$

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

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

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

Examples

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

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

Examples

- Calculate the $[OH^-]$ if the $[H^+]$ is $1.0 \times 10^{-5} M$