Thursday
April
16
2020

AIM
- What are the different acid/base theories?

AGENDA
- Acid and bases theories notes
- U10L2 video

YOYO
- Pull up the U10L2 (unit 10 lesson 2) video on YouTube

HOMEWORK
- Arrhenius Theory CL due by 11:59 pm TONIGHT
- Follow the calendar

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Acids

- Acids can be strong or weak electrolytes in aqueous solutions.
- Acids (ex: HCl) react with certain metals to produce $H_2(g)$.
- Acids cause color changes in acid-base indicators
  - Blue litmus paper turns red in an acid
  - Phenolphthalein is colorless in an acid
- Acids have a sour taste
- Table K has a list of Common Acids

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Bases

- Bases can be strong or weak electrolytes in aqueous solutions
- Bases cause color changes in acid-base indicators:
  - Red litmus paper turns blue in a base
  - Phenolphthalein is pink in a base
- Bases feel slippery and taste bitter.
- Table L has a list of Common Bases

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Arrhenius Acid

- An Arrhenius acid gives off H^+ (hydrogen ions) in aqueous solutions.
  - Ex: HCl, HBr, H_2SO_4
- The H^+ in solution attaches to H_2O to form H_3O^+ (hydronium ion).
  - $HCl + H_2O \rightarrow H^+ + Cl^- + H_2O \rightarrow Cl^- + H_3O^+$

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Arrhenius Base

- An Arrhenius base has OH and give off OH^- (hydroxide ions) in an aqueous solution.
  - Ex: NaOH, KOH, $Ca(OH)_2$
- $NaOH \rightarrow Na^+ + OH^-$
- Group 1 metals react with water to produce bases.
  - $2Na(s) + 2H_2O(l) \rightarrow 2\ NaOH(aq) + H_2(g)$

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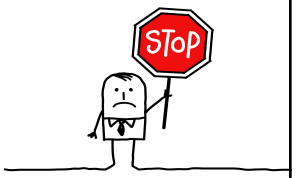
Check Point Question

Which substance can be classified as an Arrhenius acid?

a. HCl
b. NaCl
c. LiOH
d. KOH



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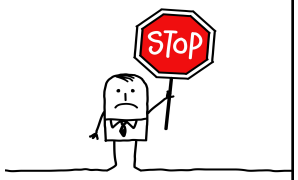
Check Point Question

Which substance can be classified as an Arrhenius base?

a. HCl
b. NaOH
c. $LiNO_3$
d. $KHCO_3$



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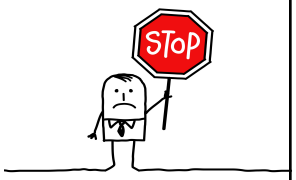
Check Point Question

According to the Arrhenius theory, a substance that is classified as an acid will always yield

a. $H^+(aq)$
b. $NH^+_4(aq)$
c. $OH^-(aq)$
d. $CO_3^{2-}(aq)$



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Bronsted-Lowry Acids and Bases

- An acid is an H^+ donor(proton donor).
- A base is an H^+ acceptor (proton acceptor)

ACID BASE

$HCl(g) + H_2O(l) \leftrightarrow H_3O^+(aq) + Cl^-(aq)$

Donates H^+ Accepts H^+

HCl is an acid because it donates an H^+ to the H_2O.

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Bronsted-Lowry Acids and Bases

BASE ACID

$NH_3(aq) + H_2O(l) \leftrightarrow NH_4^+(aq) + OH^-(aq)$

Accepts H^+ Donates H^+

NH_3 is a base because it accepts an H^+ from the H_2O.

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Bronsted-Lowry Acids and Bases

- Bronsted-Lowry Acids and Bases are…BAAD
- Bases
- Accept (H+)
- Acids
- Donate (H+)

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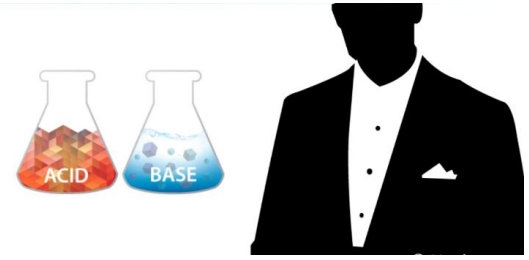
Bronsted-Lowry Acids and Bases

- Water can either be a proton donor (acid) or a proton acceptor (base); water is amphoteric.



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Check Point Question

According to the Bronsted-Lowry theory, a chloride ion (Cl^-), acts as a base when it combines with

a. An OH^- ion
b. A K^+ ion
c. An H^- ion
d. An H^+ ion

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Check Point Question

According to the Bronsted-Lowry theory, an acid is

a. A proton donor, only
b. A proton acceptor, only
c. A proton donor and a proton acceptor
d. Neither a proton donor nor a proton acceptor

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Conjugate Acids and Bases

BASE ACID

$NH_3(aq) + H_2O(l) \leftrightarrows NH_4^+(aq) + OH^-(aq)$

CONJUGATE ACID CONJUGATE BASE

A conjugate base is what remains after the acid gives up H^+.

A conjugate acid is what is formed when a base accepts a proton.

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Conjugate Acids and Bases

Conjugate Acid-Base Pairs

Conjugate Acid has an H^+

Conjugate Base Pair is the acid with 1 less H^+

Acid	Conjugate Base Pair
H_2SO_4	HSO_4^-
HCl	Cl^-
HNO_3	NO_3^-

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Conjugate Acids and Bases

- Directions: For each pair label acid, base, conjugate acid, conjugate base

Conjugate acid-base pairs

$NH_3(aq) + H_2O(l) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$

$HCl(g) + H_2O(l) \rightleftharpoons H_3O^+(aq) + Cl^-(aq)$

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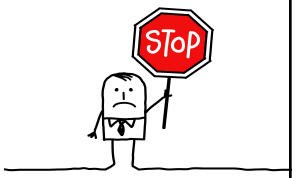
Check Point Question

In the reaction

$H_2PO_4^- + H_2O \leftrightarrow H_3PO_4 + OH^-$

which pair represents a base and its conjugate acid?

a. H_2O and $H_2PO_4^-$
b. H_2O and H_3PO_4
c. H_3PO_4 and OH^-
d. H_3PO_4 and $H_2PO_4^-$



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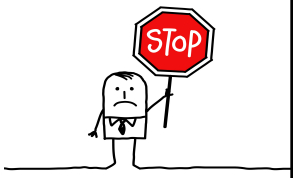
Check Point Question

Given the reaction at equilibrium

$HSO_4^- + H_2O \leftrightarrow H_3O^+ + SO_4^{2-}$

According to the Bronsted-Lowry theory, the two bases are

a. H_2O and H_3O^+
b. H_2O and SO_4^{2-}
c. H_3O^+ and $H_2SO_4^-$
d. H_3O^+ and SO_4^{2-}



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Summary

Acids	Bases

• Arrhenius
  • Gives off H^+ in in water
• Bronsted-Lowry
  • H^+ donor
	• Arrhenius
	  • Gives of OH^- in water
	• Bronsted-Lowry
	  • H^+ acceptor

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