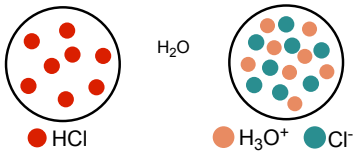
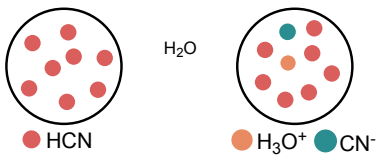
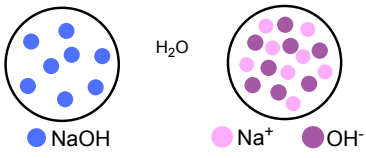
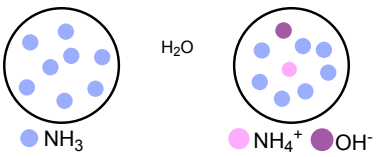
**CONCEPT:** ACID AND BASE STRENGTH

- **Recall:** Strong Acids and Strong Bases are classified as _____ *electrolytes*.
  - While Weak Acids and Weak Bases are _____ *electrolytes*.
- **Strong Acid:** an acid that dissociates (ionizes) _____ in water and _____ a proton ($H^+$) easily.
  - **Weak Acid:** only partially dissociates, donates a proton _____ readily, favors _____.

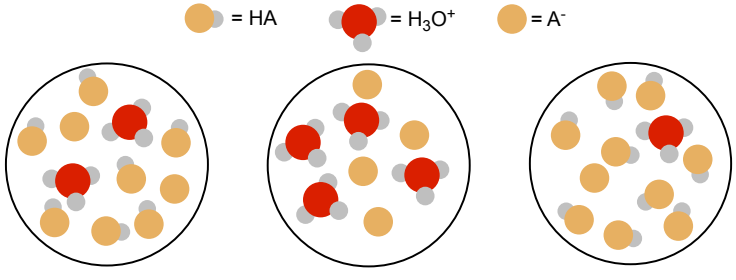
| Strong Acid | Weak Acid |
|---|---|
|  |  |
| ▫ Dissociates completely<br>▫ Easily donates proton ($H^+$)<br>▫ Favors product formation | ▫ Dissociates partially<br>▫ Less readily donates proton ($H^+$)<br>▫ Favors reactant formation |

- **Strong Base:** a base that dissociates (ionizes) _____ in water and has _____ affinity for protons.
  - **Weak Base:** only partially dissociates, has a _____ affinity for protons, favors _____.

| Strong Base | Weak Base |
|---|---|
|  |  |
| ▫ Dissociates completely<br>▫ High affinity for proton ($H^+$)<br>▫ Favors product formation | ▫ Dissociates partially<br>▫ Low affinity for proton ($H^+$)<br>▫ Favors reactant formation |

| Strong Acids | | | | Strong Bases | | | |
|---|---|---|---|---|---|---|---|
| HI | Hydroiodic acid | $HBrO_4$ | Perbromic acid | LiOH | Lithium hydroxide | $Ca(OH)_2$ | Calcium hydroxide |
| HBr | Hydrobromic acid | $HBrO_3$ | Bromic acid | NaOH | Sodium hydroxide | $Sr(OH)_2$ | Strontium hydroxide |
| HCl | Hydrochloric acid | $HClO_4$ | Perchloric acid | KOH | Potassium hydroxide | $Ba(OH)_2$ | Barium hydroxide |
| $H_2SO_4$ | Sulfuric acid | $HClO_3$ | Chloric acid | RbOH | Rubidium hydroxide | | |
| $HNO_3$ | Nitric acid | $H_3O^+$ | Hydronium ion | CsOH | Cesium hydroxide | | |

**EXAMPLE:** The following represent aqueous acid solutions. Identify the strong acid, weak acid and weakest acid.




_____ _____ _____

**CONCEPT:** ACID AND BASE STRENGTH

**Strength of Conjugate Acids & Bases**

● There is an _____ relationship between strength of acids & bases and their _____.

□ A strong acid will have a relatively _____ conjugate base.

- stronger the acid = _____ the conjugate base - weak conjugate base has _____ affinity for proton

$HCl\ (aq) + H_2O\ (liq) \longrightarrow$ _____ (aq) + _____ (aq)

strong acid _____ conjugate base

□ A weak acid will have a relatively _____ conjugate base.

- weaker the acid = stronger the conjugate base - stronger conjugate base has _____ affinity for proton

$HCN\ (aq) + H_2O\ (liq) \rightleftharpoons$ _____ (aq) + _____ (aq)

weak acid _____ conjugate base

□ Stronger the base = _____ conjugate acid □ weak conjugate acid _____ readily donates proton

□ Weaker the base = _____ conjugate acid □ stronger conjugate acid _____ donates proton

**EXAMPLE:** Which of the following acids have relatively strong conjugate bases?

a. $HBrO_4$ b. HCN c. $HNO_3$ d. $HClO_4$

**PRACTICE:** Which of the following is the strongest base?

a. $NO_3^-$ b. $F^-$ c. $Cl^-$ d. $ClO_4^-$ e. $H_2O$

**PRACTICE:** Which of the following bases will have the weakest conjugate acid?

a. $CH_3COOH$ b. $KOCH_3$ c. $CH_3NH_2$ d. $NH_4OH$ e. LiOH

**CONCEPT:** ACID AND BASE STRENGTH

**PRACTICE:** Which of the following aqueous species will contain mostly reactants?

a. $CsOH$ b. $HNO_3$ c. $Sr(OH)_2$ d. $HClO_3$ e. $Mg(OH)_2$

**PRACTICE**: Determine $[OH^-]$ in each base solution. If the base is weak, indicate the value that $[OH^-]$ is less than.

a. 0.25 M NaOH

b. 0.25 M $NH_3$

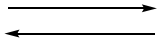
c. 0.25 M $Sr(OH)_2$

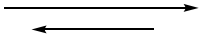
d. 1.25 M KOH

**PRACTICE**: Predict the direction of the following reaction:

$HC_2H_3O_2\ (aq) + H_2O\ (liq)$ _____ $H_3O^+\ (aq) + C_2H_3O_2^-\ (aq)$

a. 

b. 

c. 

d.