

## **A SOLUTION IS-**

Homogeneous mixtures that may be s,l,g.  
Made of solute and solvent.

### **Solute**

Substance that is dissolved.

### **Solvent-**

Substance that does the dissolving.

*Saturated Solution:* Contains the maximum amount of solute for a given quantity of solvent at a given temperature and pressure.

*Solubility:* the amount of solute that dissolves in a given quantity of a solvent to produce a saturated solution.

*Unsaturated solution:* A solution that contains less solute than a saturated solution at a given temperature and pressure.

*Miscible:* two solutions are miscible if they dissolve in each other in all proportions. ex: water and ethanol

*Immiscible:* Liquids that are insoluble in one another ex. oil and water

*Supersaturated solution-***when you**

**dissolve more solute than you**

**should be able to in a solvent by heating solvent.**

# FACTORS THAT AFFECT RATE OF DISSOLVING:

- ① stirring - increases motion of particles making more collisions btwn solute ; solvent particles.
- ② crush solute - increases the surface area exposed to solvent.
- ③ heat the solvent - increases kinetic energy (motion) of particles.  
More energy makes more collisions between solute ; solvent particles.

## In Water:

**Elements** have a low solubility in water and therefore do not conduct electricity.

**Ionic Compounds** with HIGH solubility will break apart into ions and will conduct electricity.  $\text{NaCl}_{(s)} \rightarrow \text{Na}^+_{(aq)} + \text{Cl}^-_{(aq)}$

**Ionic Compounds** with LOW solubility do not break apart and do not conduct.

**Molecular Compounds** with HIGH or LOW solubility do not dissociate and do not conduct. Like dissolves like.

**Acids** usually have HIGH solubility and ionize to produce  $\text{H}^+$  ions and conduct.

**Bases** with HIGH solubility dissociate into a positive ion and an  $\text{OH}^-$  ion and these do conduct.

**Bases** with LOW solubility do not dissociate and do not conduct.

# IS THE SUBSTANCE AN ELEMENT, MOLECULE OR IONIC COMPOUND?

## Molecular, Element

All Elements are considered insoluble.  
Is the molecule soluble?

- Polar dissolves polar
- Nonpolar dissolves non polar

### Is the compound?

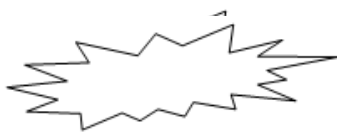
Insoluble:  
(s), (l), (g)

or



Soluble:  
(aq)

Molecules have been separated as they dissolve (but don't dissociate).



**Properties:**

- \*Non-electrolyte
- Neutral

## Ionic compound (Including acids and bases)

### Is the compound?

Insoluble:  
(s)



**Properties:**

- Non electrolyte

Soluble- ions have been separated as they dissolve.



**Properties:**

- electrolytes

Is the Ionic compound an acid, base or neutral?

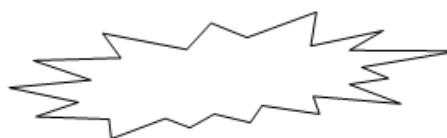
Acids: H\_\_\_(aq) or \_\_\_COOH(aq)



Bases: metal + OH (aq)



Neutral: metal + non metal (aq)



Place the following in the proper boxes N<sub>2</sub>, C<sub>2</sub>H<sub>5</sub>OH, BaSO<sub>4</sub>, HCl, KOH, S<sub>8</sub>, C<sub>3</sub>H<sub>8</sub>, NH<sub>3</sub>, BaCl<sub>2</sub>, Ca(OH)<sub>2</sub>, CH<sub>3</sub>COOH, (NH<sub>4</sub>)<sub>2</sub>S, Ba(OH)<sub>2</sub>, Na<sub>3</sub>PO<sub>4</sub>, HNO<sub>3</sub>, Cu, NaNO<sub>3</sub>.

## Concentration of Ions

Remember!!

-Ionic compounds (including bases) dissociate in water and acids ionize into their positive and negative ions, this is why solutions may conduct electricity.

-Concentration is expressed in mol/L

You can use a **DISSOCIATION EQUATION** to help you determine the molar concentration of the ions in solution.

Example: Given a 0.12 mol/L solution of *0.24M*  $\text{Ba}(\text{OH})_{2(\text{aq})}$ , determine the molar concentration of the cation and the anion.

1. Write the dissociation equation (split the compound into its ions and balance)



2. What is the molar concentration of the compound?

3. The ion concentration is the whole number coefficient (# of moles) multiplied by the original concentration.

The concentration of  $\text{Ba}^{2+} = 0.12 \text{ mol/L} \times 1 = 0.12 \text{ mol/L}$

The concentration of  $\text{OH}^{-} = 0.12 \text{ mol/L} \times 2 = 0.24 \text{ mol/L}$

Try:

1. Write balanced reaction equation that show which ions are produced when the following substances are dissolved in water.

a. lithium hydroxide  $\text{LiOH}_{(aq)} \rightarrow \text{Li}^+_{(aq)} + \text{OH}^-_{(aq)}$

b. potassium phosphate  $\text{K}_3\text{PO}_4_{(aq)} \rightarrow 3\text{K}^+_{(aq)} + \text{PO}_4^{3-}_{(aq)}$

c. strontium chloride

d. chromium(III) sulfate

2. Iron(III) nitrate has a solubility of 0.15 M. Find concentration of the ions in solution.