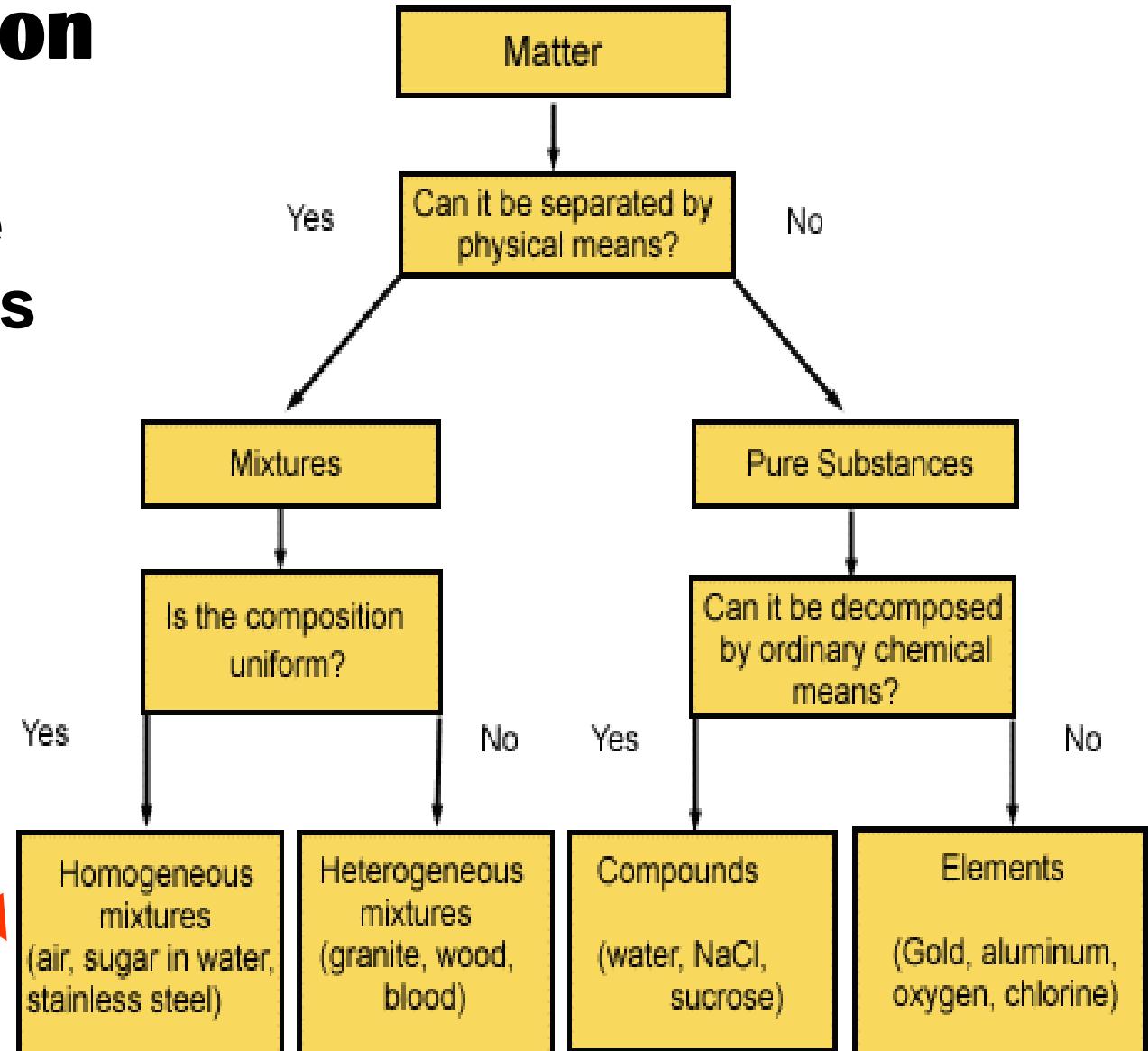


N-39 - Properties of Solutions

Target: I can describe various concepts about solutions

Classification of Matter

Solutions are homogeneous mixtures



Solute

A solute is the substance that is being dissolved in a solution.

Salt in salt water

Sugar in soda drinks

Carbon dioxide in soda drinks

Solvent

A solvent is the thing that something is being dissolved into.

Water in salt water

Water in soda

Solution

The solute + solvent combined is then called the “solution”

Salt water

Soda

Solubility

The amount of solute that can be dissolved at a given temperature.

Types of Solutions

Solution Phase	Solute Phase	Solvent Phase	Example
Gaseous Solutions	Gas Liquid <i>Solid*</i>	Gas Gas Gas *	Air (mostly N ₂ and O ₂) Humid air (H ₂ O droplets in air) <i>Moth balls*</i>
Liquid solutions	Gas Liquid Solid	Liquid Liquid Liquid	Soda (CO ₂ in H ₂ O) Rubbing Alcohol (alcohol in H ₂ O) Seawater (NaCl in H ₂ O)
Solid solutions	Gas * Liquid Solid	<i>Solid*</i> Solid Solid	<i>Gas Stove Lighter (H₂ and Pd)*</i> Dental fillings and other Amalgams Brass Alloy (Zn in Cu)

*Combinations in italics and with a * are rare, very few “normal” examples. Most charts leave them off because there are so few examples – they are still possible, just rare*

Saturation...

- **Saturated solution:** The maximum amount of solute dissolved
- **Unsaturated solution:** Less than the maximum amount of solute dissolved
- **Supersaturated solution:** More than the maximum amount of solute dissolved

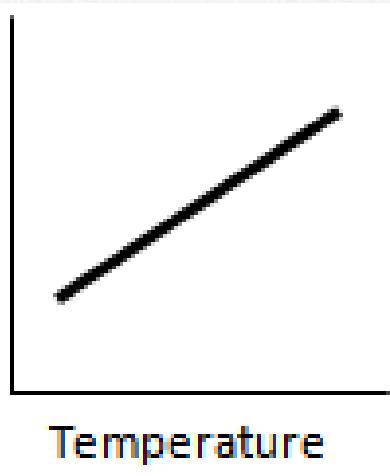
<http://www.youtube.com/watch?v=0wifFbGDv4I>

Colloids...not really solutions...tricky...

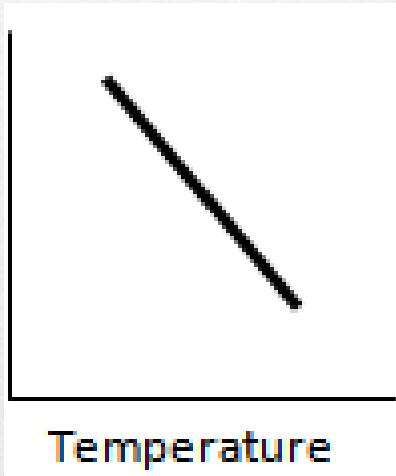
- When “large” particles are suspended in a substance (*5 – 200 nm is considered “big”*)
- Fat molecules suspended in milk, whipped cream, butter, mayo
- Air bubbles suspended in foam rubbers
- Color particles suspended in glass, paint, cosmetics,
- Fog, smoke, clouds, aerosols

Solubility

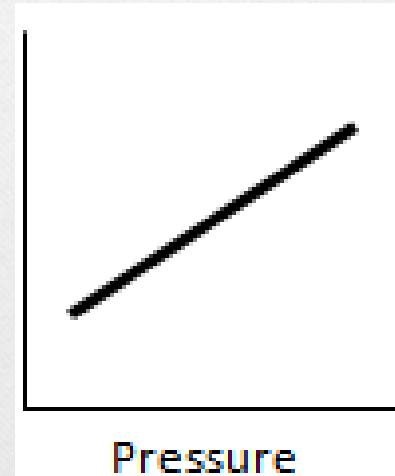
Temperature and Pressure can affect solubility. Gases and solids are affected differently sometimes.



Solids

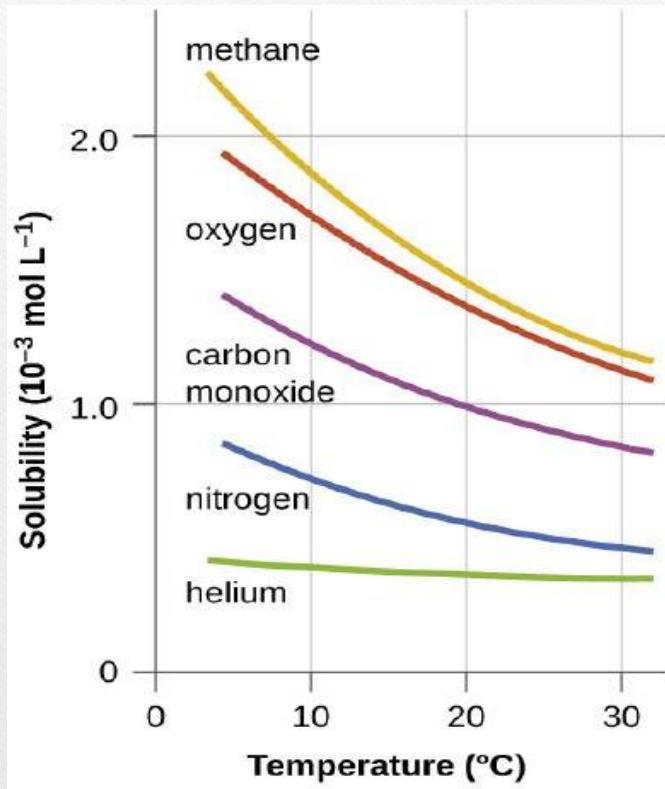
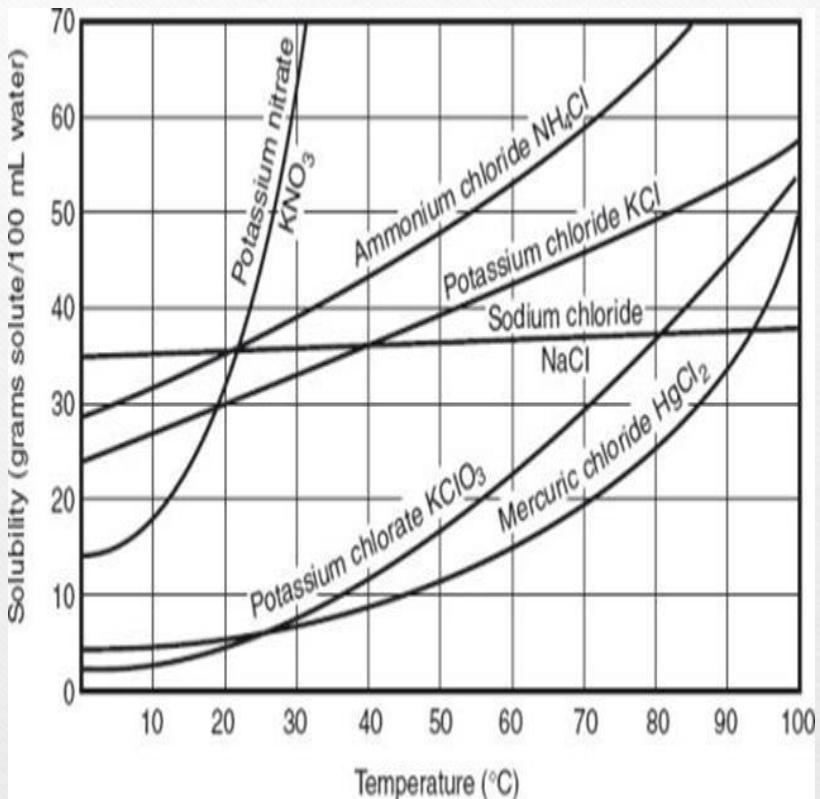


Gases



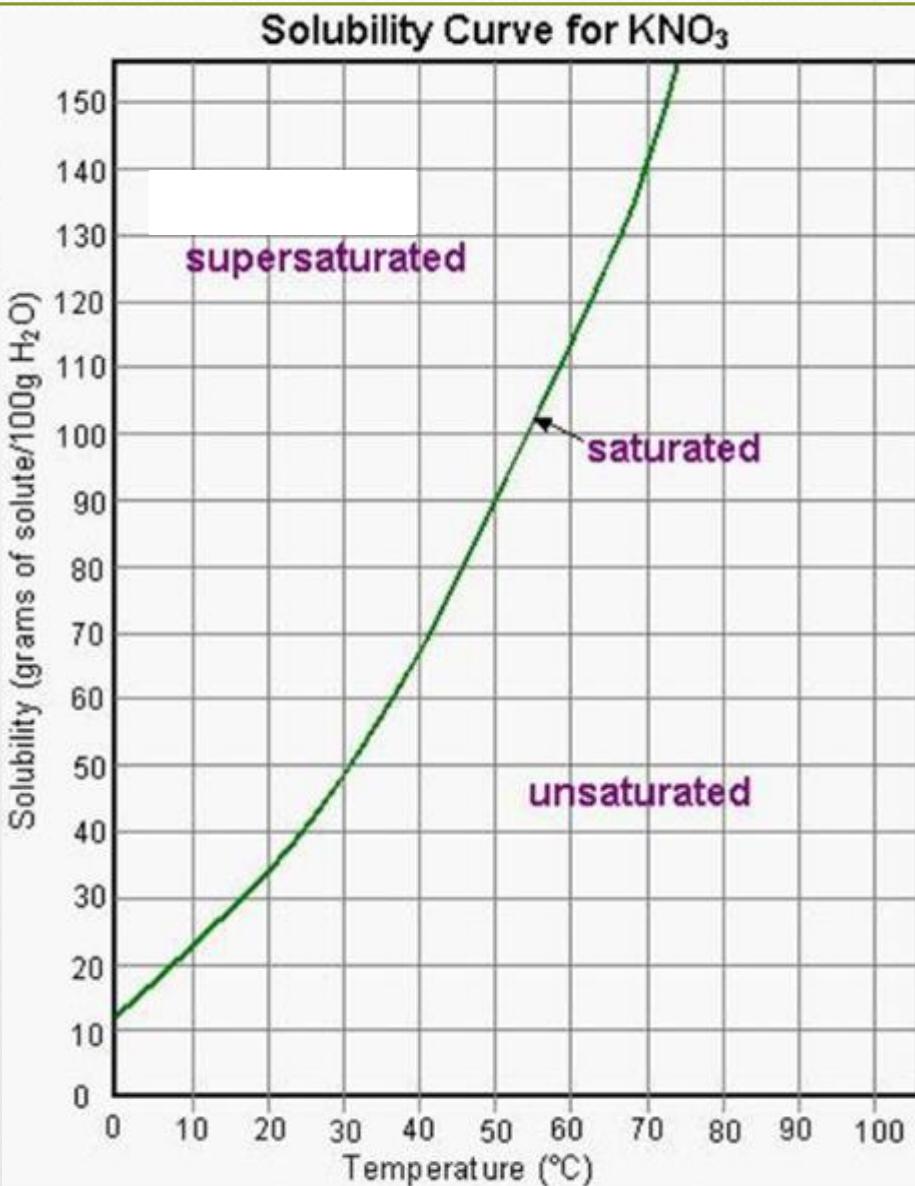
Gases

Solubility



Solubility

Can identify saturation points using a solubility curve.



Solubility
Solubility
curve is going
to be more
accurate
than our
general chart

Solubility of Some Ionic Compounds in Water		
<u>Always Soluble</u>		
Alkali metals =	Li^+ , Na^+ , K^+ , Rb^+ , Cs^+	AAA
Ammonium =	NH_4^+	CNP
Acetate =	$\text{C}_2\text{H}_3\text{O}_2^-$	
Chlorate =	ClO_3^-	
Nitrate =	NO_3^-	
Perchlorate =	ClO_4^-	
<u>Generally Soluble</u>		
Cl^- , Br^- , I^-	Soluble <u>except</u> : Ag^+ , Pb^{2+} , Hg_2^{2+}	AP-H
F^-	Soluble <u>except</u> : Ca^{2+} , Ba^{2+} , Sr^{2+} , Pb^{2+} , Mg^{2+}	CBS-PM
Sulfate = SO_4^{2-}	Soluble <u>except</u> : Ca^{2+} , Ba^{2+} , Sr^{2+} , Pb^{2+}	CBS-P
<u>Generally Insoluble</u>		
O^{2-} , OH^-	Insoluble <u>except</u> : Alkali metals and NH_4^+	AA
	<u>Somewhat</u> soluble: Ca^{2+} , Ba^{2+} , Sr^{2+}	CBS
CO_3^{2-} , CO_3^{2-}		
S^{2-} , SO_3^{2-}	Insoluble <u>except</u> : Alkali metals and NH_4^+	AA
PO_4^{3-}		
CrO_4^{2-} , $\text{Cr}_2\text{O}_4^{2-}$		
Not Soluble = forms precipitate		
Soluble = dissolves in water (aqueous)		

Dissolve

When molecules of solute are surrounded by molecules of solvent and are pulled apart from other solute molecules

Dissociate

When an ionic compound has its ionic bond disrupted by solvent molecules and breaks into its individual ions

Electrolytes:

- Ionic solutes that dissociate (come apart) into ions in a solution



They can conduct electricity because there are charged particles for the electrons to move between!

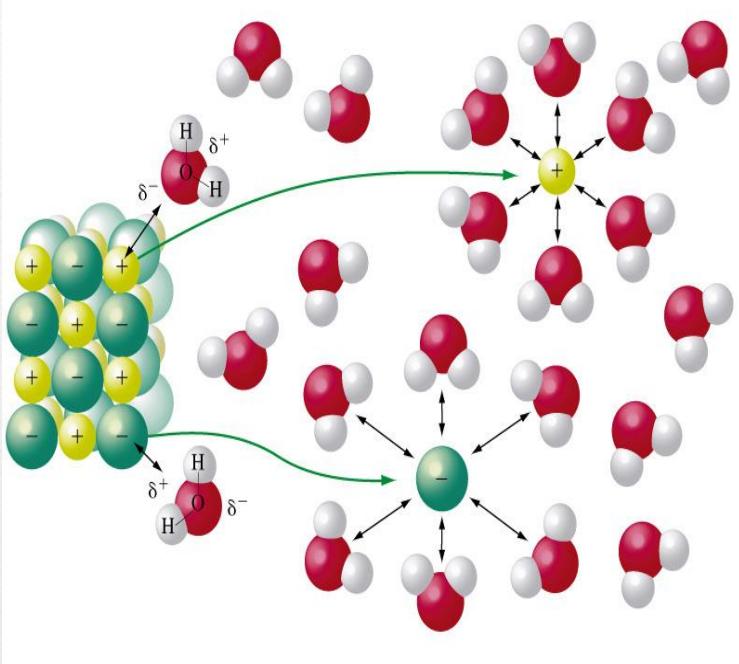
Non-Electrolytes:

- Covalent solutes that do not dissociate, but that can still potentially dissolve in a solvent

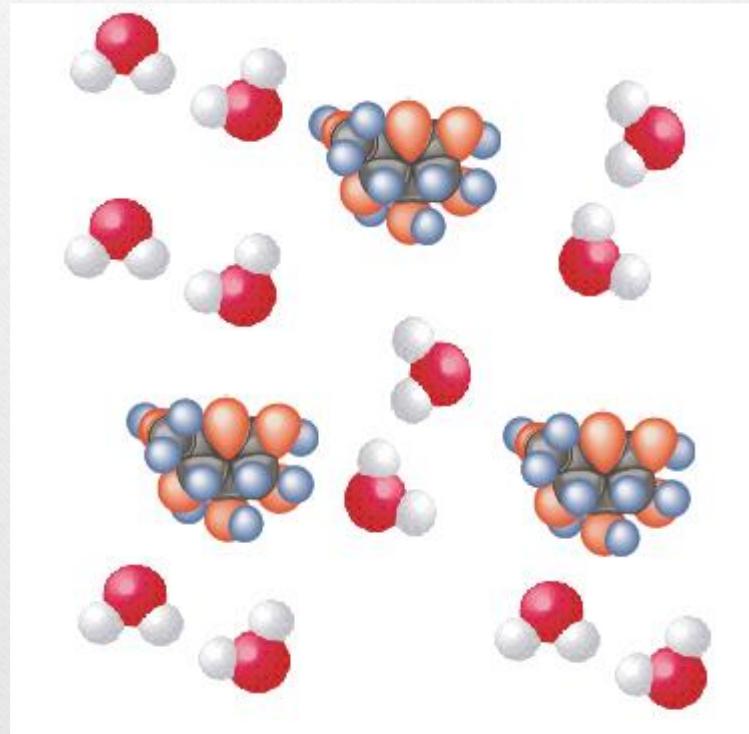


Which is dissolving and which is dissociating?

Dissociating



Dissolving



Dissolving Process

Heat of Solution

Can either be exothermic or endothermic

“Like Dissolves Like”

- Polar things dissolve in polar things,
- Non-polar things dissolve in non-polar things

Increasing Dissolution (how fast something dissolves)

Solids

- Increase temperature for more collisions
- Stir it to expose more surface area
- Crush it up so more surface area

Gases

- Decrease temperature
- Increase pressure

