

Solutions

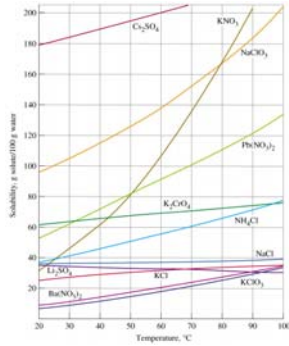
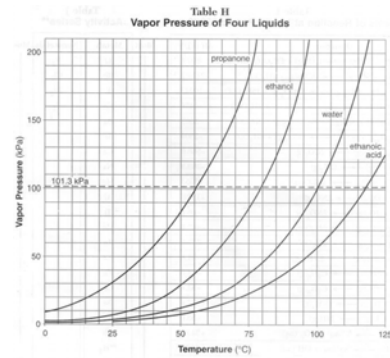


Table F Solubility Guidelines for Aqueous Solutions

Ions That Form Soluble Compounds	Exceptions	Ions That Form Insoluble Compounds	Exceptions
Group 1 ions (Li ⁺ , Na ⁺ , etc.)		carbonate (CO ₃ ²⁻)	when combined with Group 1 ions or ammonium (NH ₄ ⁺)
ammonium (NH ₄ ⁺)		chromate (CrO ₄ ²⁻)	when combined with Group 1 ions, Ca ²⁺ , Mg ²⁺ , or ammonium (NH ₄ ⁺)
nitrate (NO ₃ ⁻)		phosphate (PO ₄ ³⁻)	when combined with Group 1 ions or ammonium (NH ₄ ⁺)
acetate (C ₂ H ₃ O ₂ ⁻ or CH ₃ COO ⁻)		sulfide (S ²⁻)	when combined with Group 1 ions or ammonium (NH ₄ ⁺)
hydrogen carbonate (HCO ₃ ⁻)		hydroxide (OH ⁻)	when combined with Group 1 ions, Ca ²⁺ , Ba ²⁺ , Sr ²⁺ , or ammonium (NH ₄ ⁺)
chlorate (ClO ₃ ⁻)			
perchlorate (ClO ₄ ⁻)			
halides (Cl ⁻ , Br ⁻ , I ⁻)	when combined with Ag ⁺ , Pb ²⁺ , and Hg ₂ ²⁺		
sulfates (SO ₄ ²⁻)	when combined with Ag ⁺ , Ca ²⁺ , Sr ²⁺ , Ba ²⁺ , and Pb ²⁺		



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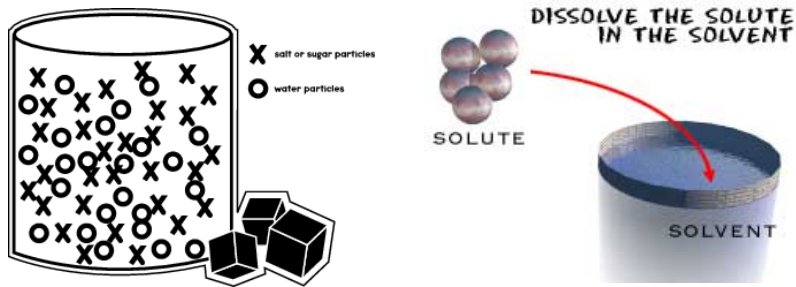
Solutions

- are _____ mixtures of ____ or more substances in a _____ phase
 - Have a _____ composition throughout
- Have the same _____ throughout
- All materials pass through a filter in the _____ phase
- May exist as all forms of matter
 - Gas = _____
 - Liquid = _____
 - Solid = _____ (actually a _____ / _____ mixture)

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Solutions continued

- Solvent: → _____ medium in a solution
- Solute: → material _____ in a solution
 - (typically in _____ quantity)



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Suspensions and Colloids

- Suspensions: ex. Muddy water
 - Particles are big and will _____ out if not agitated
 - Would be _____ in a filter
- Colloids: ex. Milk
 - Particles size _____ solution and suspension
 - Particles do _____ - out
 - Would typically _____ through a filter

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Electrolytes

- Electrolyte: a substance that _____ in water to give a solution that conducts an _____
 - ex. Na^+ and Cl^- in water
 - _____ and other _____ molecules will dissolve in water and may be electrolytes
- Non-electrolyte: a substance that dissolves in water, but does _____ an electric current (ex. _____)

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Solubility

- amount of _____ that will form a _____ solution in a specific amount of solvent at a certain _____ (TABLE __)
 - Saturated= _____ dissolved solute in a solution
 - Unsaturated= _____ than a saturated solution under the same _____ (_____/_____)
 - Supersaturated= _____ than a saturated solution under the same conditions (ex. temp etc.)

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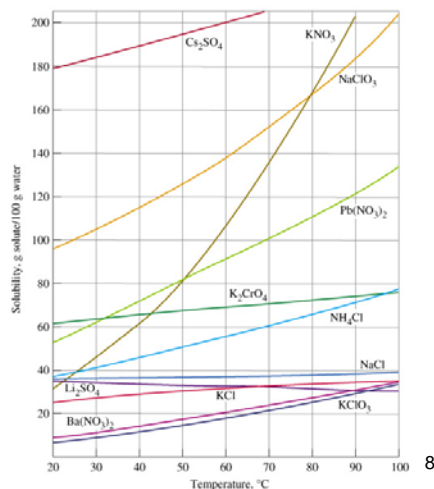
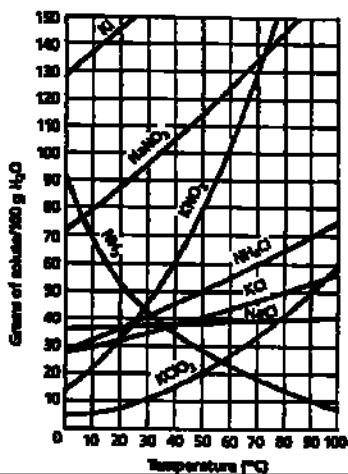
Supersaturated Solutions

- heated to a _____ temperature to dissolve
- Solution is left _____ to _____
- Solution will hold more solute at the _____ temperature than the saturated solution normally would
- _____ will eventually occur at the lower temperature as these are _____ solutions
 - Used to make _____!!! And other _____

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Table G

- Used to determine _____ based on temperature of _____ and amount of _____ in grams



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Table G Questions

- How much Potassium Iodide will dissolve in 100g of water at 10°C?
 - About _____
- If I had a 40.0g sample of NaCl;
 - Would I be able to dissolve all of it in 100g of water at 75°C?
 - _____
 - What temperature would I need to heat the water to, in order to dissolve this amount?
 - _____
- If I had a solution of 80g of KNO_3 in 100g of water at 65°C, how much KNO_3 would I need to add to make it a saturated solution?
 - ~ _____

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Solution Equilibrium

- when dissolution/dissociation/dissolving and crystallization of the solute occur at _____ rates
- Factors affecting dissolution(dissolving) rates:
 - Increased _____ → granulated vs. powdered sugar
 - _____ → disperses particles and increases contact with fresh solvent
 - _____ → movement of particles increases and collisions between solvent and solute are of higher energy

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Temperature and Solubility

- Gas in a liquid: ___ in temp will cause a ___ in solubility as the molecules will move faster and escape easier
- Solid in a liquid: ___ in temp will generally cause an ___ in solubility (though rates may vary depending on the solute)
 - Some solutes will have a ___ in solubility, with temperatures ___

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Concentrations of Solutions

- Dilute and concentrated are relative terms
 - Dilute = _____ amount of solute in a solution
 - Or you can _____ extra water to dilute a solution
 - Concentrated = _____ amount of solute in a solution
 - Or you can _____ water from a dilute solution to make it more concentrated
 - No real measurement went into making solutions

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Table F

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Table F continued

- Used to determine if a _____(ppt) will form when 2 _____ solutions are mixed
- Will a ppt form if a silver nitrate solution and sodium chromate solution are mixed together?
 - Write out the double replacement reaction
 - Verify solubility's of all compounds
- Silver nitrate+sodium chromate→silver chromate+sodium nitrate-

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Table F continued

- Will a ppt form in a mixture of sodium acetate and potassium phosphate?
- Sodium Acetate+Potassium Phosphate→Sodium Phosphate + Potassium Acetate

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Dissociation

- Separation of ions that occurs when an ionic compound dissolves
- $\text{NaCl} \rightarrow \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
- 1 mole \rightarrow 1 mole $+ 1$ mole = (2 moles of ions)
- $\text{CaCl}_2 \rightarrow \text{Ca}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq})$
- 1 mole \rightarrow 1 mole $+ 2$ moles = (3 moles of ions)
- Ionic Compounds have more _____ in solution compared to molecular structures such as sugar
- $\text{C}_{12}\text{H}_{22}\text{O}_{11}(\text{s}) \rightarrow \text{C}_{12}\text{H}_{22}\text{O}_{11}(\text{aq})$
- 1 mole \rightarrow 1 mole total

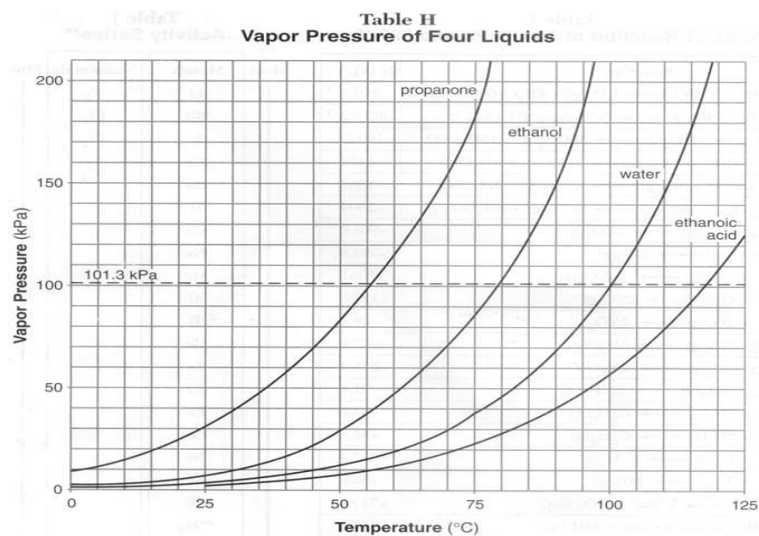
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Colligative Properties

- presence of _____ will affect the _____ of a solution
 - _____
 - _____
 - _____
- Properties are dependent upon the _____ of the solute _____ (not the _____ of solute)

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Vapor Pressure: TABLE H



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Vapor Pressure continued

- Molecules on the surface of a liquid may have enough energy to escape into the _____ phase (_____)
 - H₂O vapor, gas vapor etc.
- As temperature _____, KE of the particles will _____ and more may escape to the gas phase
- These new gases will exert _____ on the materials _____ them = _____
- When solute is added, the concentration of solvent molecules near the surface _____ (less can go into air)
 - Vapor pressure will be _____
 - Pure water would exert _____ pressure than salt water based on this as _____ can go into air and exert pressure below

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Freezing Point Depression

- Addition of solute will _____ the FP of a solvent
- For each _____ of solute _____ added per Kg H₂O, a constant _____ will occur in the FP (_____°C)
- Particles can be _____ or _____
- _____ solutions (ex. sugar) have the _____ of particles as the starting reactant
- _____ solutions have _____ moles of particles than starting amount of reactant (ex. salt)
 - This is the reason why roads are salted
 - Helps to prevent freezing until lower temps

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Boiling Point Elevation

- With addition of solute, _____ is needed to boil
- For each mole of solute _____ added per Kg H_2O , a constant ___ will occur in the BP (_____)
- K_b = molal BP constant (for water \rightarrow _____)
 - More ___ needed to raise the _____ so that it equals _____ pressure
 - Salt potato's will boil at a _____ temperature than _____ water due to the addition of solute particles

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