



# Do Now ...March 27, 2017

Obj: Calculate how to make dilutions from stock solutions.

Copy and Solve:  $M_1V_1 = M_2V_2$

I have an initial volume of 2.0L and a molarity of 2.0 M. What will be the final molarity if I dilute (add water) to a volume of 8.0L?

# Monday, March 27, 2017

**Today:**

W-Up, Notes & Practice: Dilutions

**Homework:** Study for Mini-Test  
Tomorrow

# Solutions by Dilution

$$M_1V_1 = M_2V_2$$

100.0 mL of 2.500 M KBr solution is on hand. You need 0.5500 M. What is the final volume of solution which results?

$$(2.500 \text{ mol/L}) (100.0 \text{ mL}) = (0.5500 \text{ mol/L}) (x)$$

$$x = 454.5 \text{ mL}$$

# Solutions by Dilution

To dilute a solution means to add more solvent without the addition of more solute.

*The amount of solute stays constant.*

*So,*

moles before dilution = moles after dilution

# Solutions by Dilution

We use:

$$M_1V_1 = M_2V_2$$

$$(\text{Molarity}_1)(\text{Volume}_1) = (\text{Molarity}_2)(\text{Volume}_2)$$

# Solutions by Dilution

$$M_1V_1 = M_2V_2$$

53.4 mL of a 1.50 M solution of NaCl is on hand, but you need some 0.800 M solution. How many mL of 0.800 M can you make?

$$(1.50 \text{ mol/L}) (53.4 \text{ mL}) = (0.800 \text{ mol/L}) (x)$$

$$x = 100.0 \text{ mL}$$

# Solutions by Dilution

1. How would you prepare 100 mL of 0.40 M  $\text{MgSO}_4$  from a stock solution of 2.0M  $\text{MgSO}_4$ ?
2. You have a 2.0 M solution of NaCl. Calculate the volume you must dilute to make 2.0 L of 0.50 M NaCl solution.
3. You have a 4.0 M solution of  $\text{KNO}_3$ . Calculate the volume you must dilute to make 50 mL of 0.2 M  $\text{KNO}_3$  solution.



# Warm-Up

$$\text{Molarity} = \text{mol/L}$$

$$\text{Mol} = \text{grams/GFM}$$

Find the molarity for:

1. 3.0 moles of NaCl in 1.5 L
2. 3.0 grams of NaCl in 1.5 L
3. Find the number of grams of NaCl in 1.8 L of a 2.0 M solution of NaCl.
4. Find the number of grams of NaCl in 1800 mL of a 2.0M solution of NaCl

# Tuesday, March 28, 2017

**Today:**

W-Up, Notes & Practice: Solvation  
(dissolving), Quiz

**Homework:**

# Electrolytes (Video)

When dissolved in water do electrolytes conduct electricity?

Electrolytes are substances that produce positive and negative ions when dissolved.

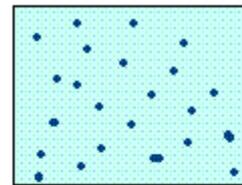
E.g.  $\text{Na}^+$  is a cation  
 $\text{Cl}^-$  is an anion

# Colligative Properties Practice

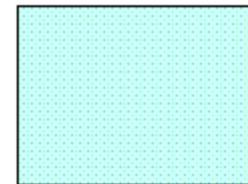
1. Which has the most particles?
2. Place in order of boiling point.

3. Place in order of freezing point.

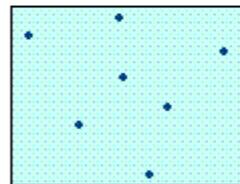
4. How and why are #2 and #3 related?



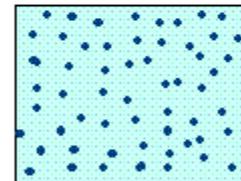
Gatorade



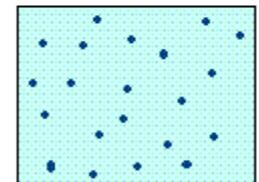
Pure Water



A



B



C

• = Particle (ion, atom, or molecule)

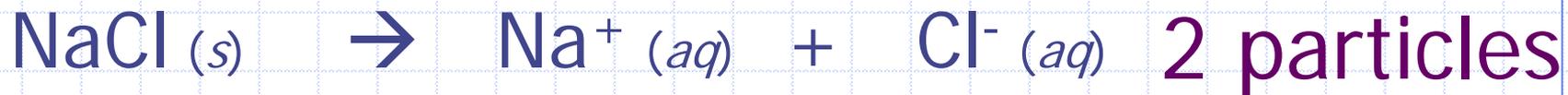
# Colligative Properties

Properties that depend only on the number of particles in solution.

For example:

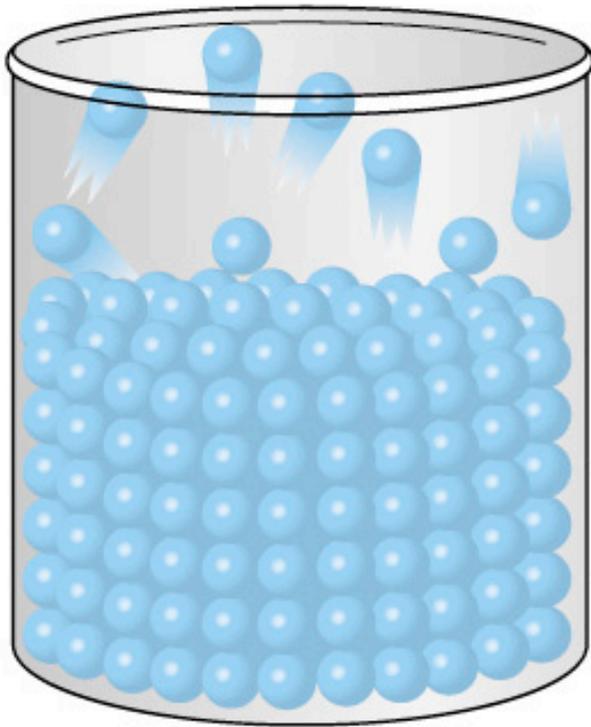
- Freezing Point
- Boiling Point

# Colligative Properties & Ions

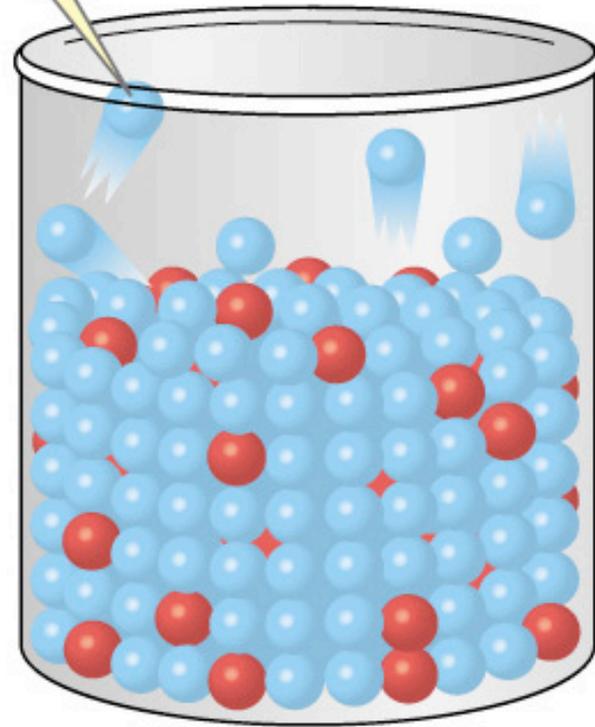


More particles  $\rightarrow$  higher boiling point,  
lower freezing point

Fewer solvent molecules  
leave surface, lowering  
vapor pressure



● Pure solvent



● Solvent with  
nonvolatile solute

# Colligative Properties

Why does the number of particles dissolved in the solution elevate (raise) the boiling point and depress (lower) the freezing point?





# Do Now ...March 29, 2017

Obj: Investigate and analyze data on colligative properties.

Copy and Solve:

Why so we put salt on the roads in the winter?

How does make this happen?

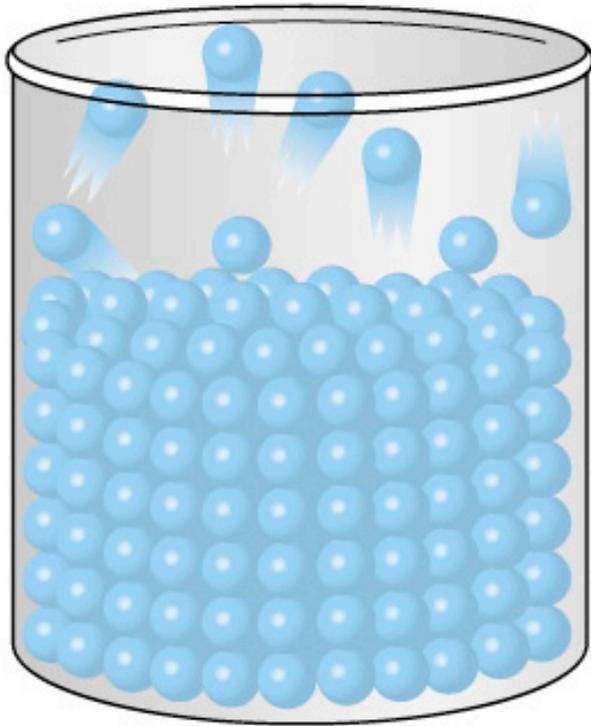
# Wednesday, March 29, 2017

**Today:**

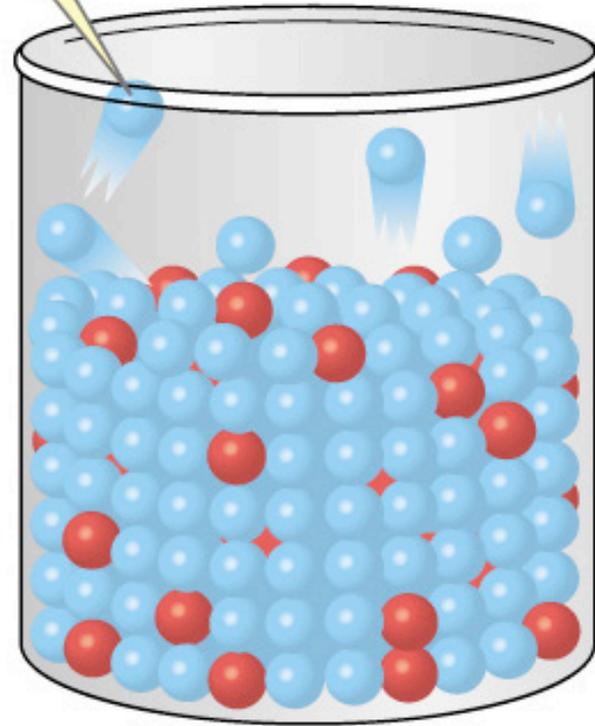
W-Up, Lab: Colligative Properties

**Homework:**

Fewer solvent molecules  
leave surface, lowering  
vapor pressure



● Pure solvent

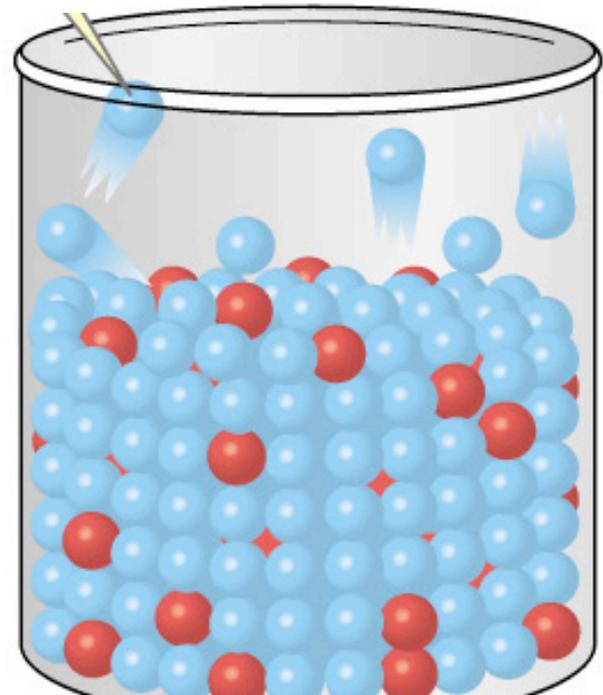
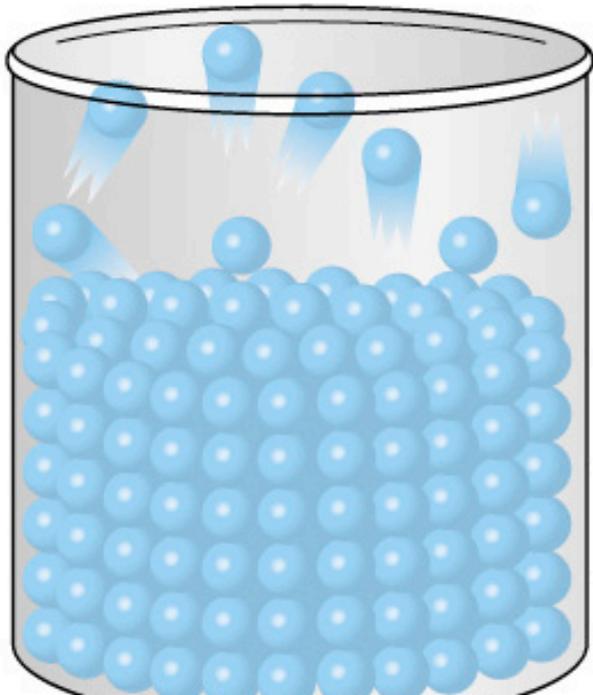


● Solvent with  
nonvolatile solute

For Boiling

# For freezing ...

additional particles interfere  
with crystal formation



# Important!

**Do not** dump your beaker after each step!

Just continue to the next step. You will add 2.5g for step 2, 3, 4.

Your totals will be 0, 2.5, 5.0, and 7.5g of salt.





# Do Now ...March 30, 2017

Obj: Investigate and collect data on colligative properties.

Copy and Solve:

What is the effect on the freezing and boiling point of water when you add salt?

# Thursday, March 30, 2017

**Today:**

W-Up, Finish Lab: Colligative Properties,  
**QUIZ!**, Review for Unit Test Monday

**Homework:** Study of Unit Test on  
Monday

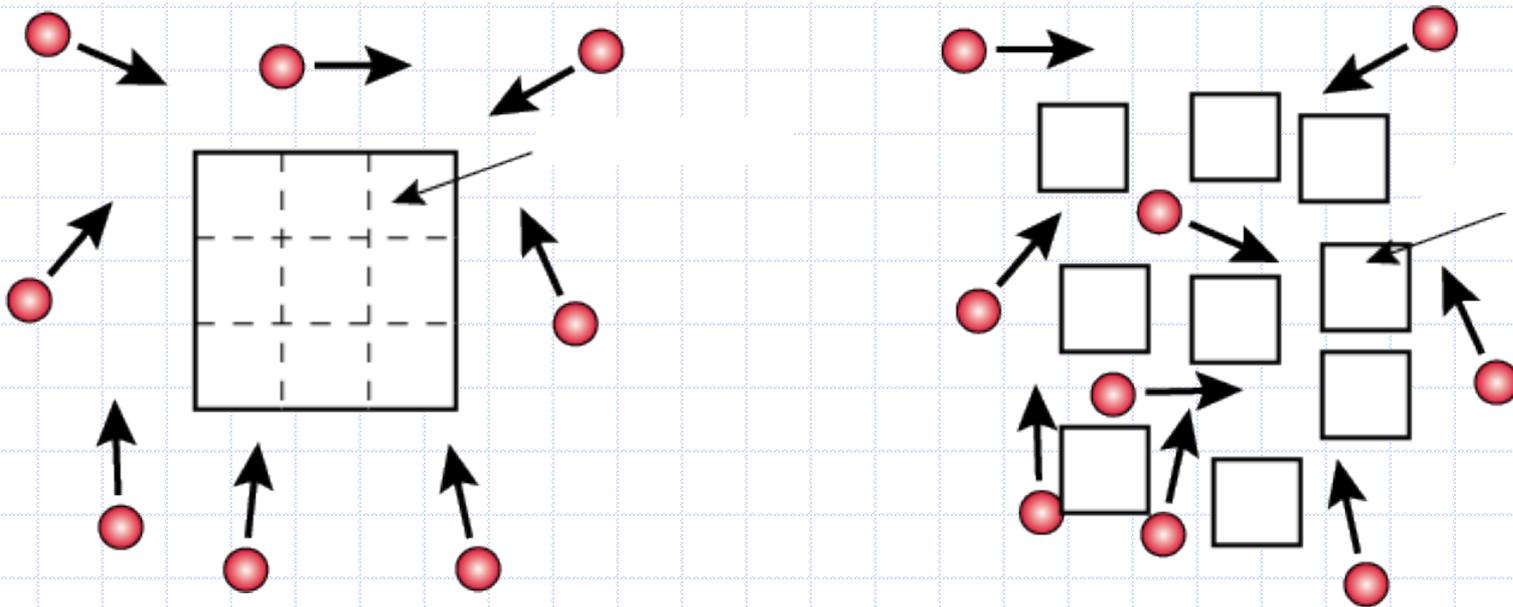
# Solvation (Dissolving)

Factors that increase the rate of solvation (i.e. make solutes dissolve faster):

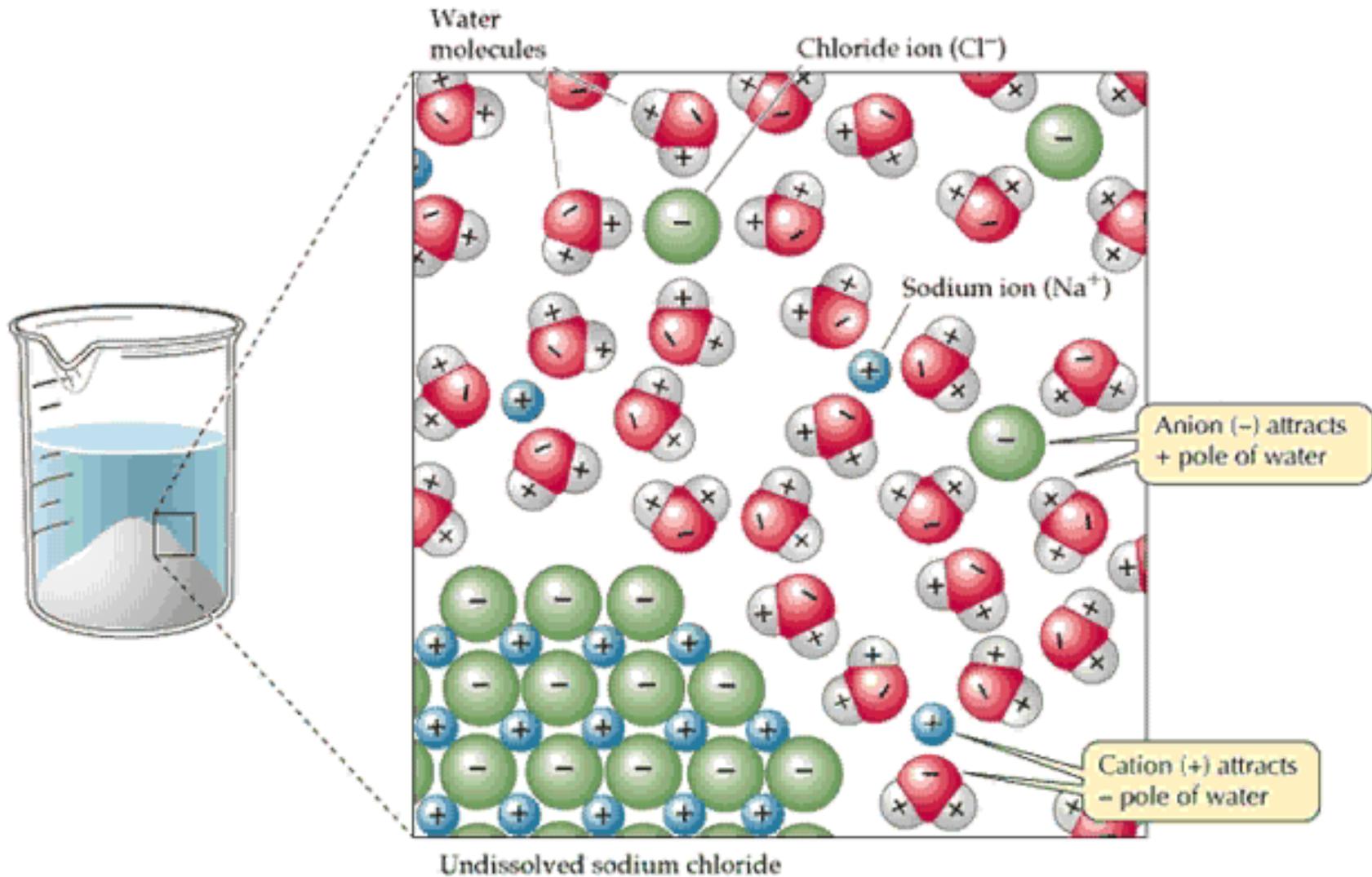
- Agitation (shake it up).
- Increase surface area (break it up).
- Increase temperature (heat it up).
- Add more solvent.

# Solvation (Dissolving)

increased surface area = more contact with solvent



# Solvation





# Friday, March 31, 2017

**Today:**

W-Up, Equilibrium Demo, Practice Test

**Homework:** Study for Unit Test Friday

Bring a calculator for  
the unit test Monday!

# Warm Up

What does the symbol  $\rightleftharpoons$  indicate?

What is taking place at  $\rightleftharpoons$  ?

What is meant by a reverse reaction?

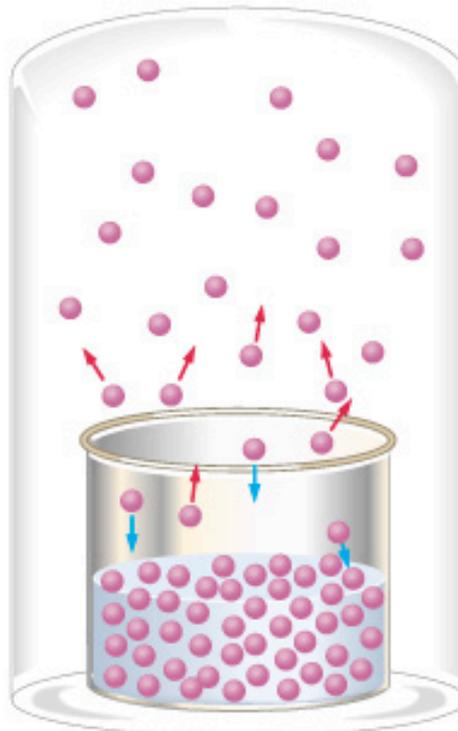
# Evaporation and Equilibrium

↑ Molecules undergoing **vaporization**

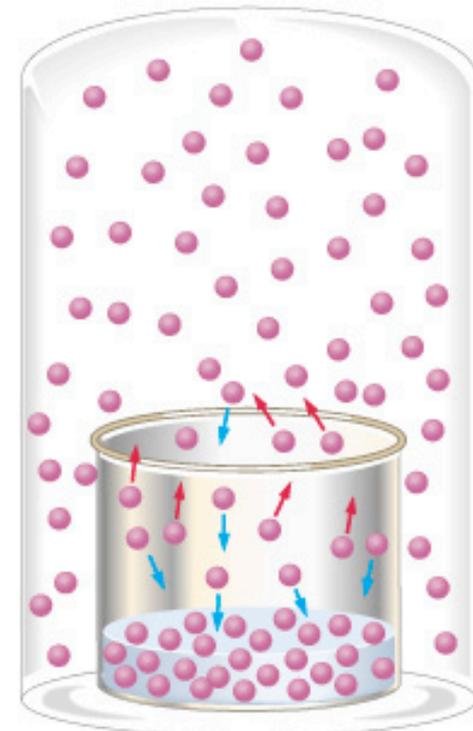
↓ Molecules undergoing **condensation**



(a) Vaporization



(b) Vaporization  $>$  condensation  
rate rate



(c) Vaporization  $=$  condensation  
rate rate

# Equilibrium Position

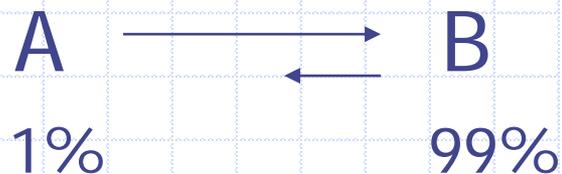
The equilibrium position shows the **relative concentrations** of the reactants and products at equilibrium.



or



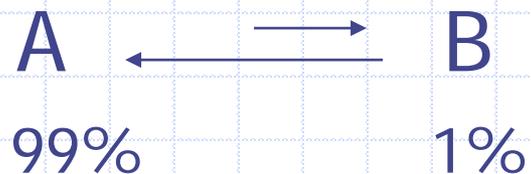
# Equilibrium Position Lies to the Right



Equilibrium Position Lies to the Right



# Equilibrium Position Lies to the Left



Equilibrium Position Lies to the Left



# Le Chatelier's Principle

When a system undergoes a change, processes occur that then to counteract the change and establish a new equilibrium.

What does this mean?



# Le Chatelier's Principle

Ammonia (NH<sub>3</sub>) is made through the **Haber** process.



# Le Chatelier's Principle: Concentration

Ammonia (NH<sub>3</sub>) is made through the Haber process.



## Changing Concentration

If we add more product to the system (NH<sub>3</sub>) the equilibrium will move towards the reactants.

Removing some of the product shifts the equilibrium towards reactants.



# Le Chatelier's Principle: Temperature



## Changing Temperature

Increasing the temp. causes the equilibrium to shift in the direction that absorbs heat.

The system above is absorbing heat so the equilibrium shifts towards the right.

See a video at

<http://www.youtube.com/watch?v=0XQVXFL4uoo&feature=related>



# Le Chatelier's Principle: Pressure

Ammonia (NH<sub>3</sub>) is made through the Haber process.



## Changes in Pressure

If there are unequal moles of gaseous reactants and products *the equilibrium shifts towards the side with fewer moles of gas.*



# Le Chatelier's Principle

If you do something to disturb a system, the system responds in a way that partially undoes what you have just done.



# Demo

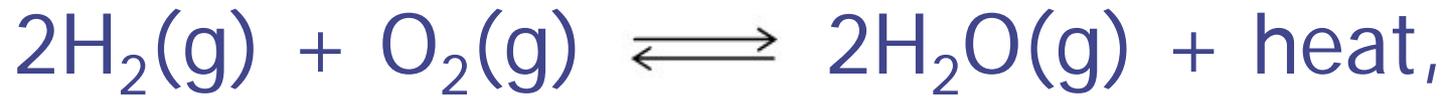
Adding HCl and then H<sub>2</sub>O.

Adding AgCl

Hot and Cold

# Practice

Based on the equation,



What is the effect of increasing the temperature?

Of adding more  $\text{O}_2(\text{g})$ ?

Of increasing the pressure?



# Practice

1. Given the equilibrium



How would the equilibrium respond to if I added heat to the reactants in the reaction?

If I added more  $\text{H}_2\text{O}(\text{g})$ ?

# Catalysts

Catalysts speed up the forward and reverse reactions.

They **do not** affect the equilibrium position; just how fast equilibrium is reached.









# Do Now ... April 3, 2017

Obj: Describe how temp, pressure, and addition of solute affects chem. Equilibrium.

Complete:

Equilibrium,  $\rightleftharpoons$ , takes place when reactants and products are forming at equal rates.

There is no net (overall) change in concentration.

# Friday, March 31, 2017

**Today:**

W-Up, Unit Test: Solutions

**Homework:**

# Warm-Up

1. If I have a 3.0 M solution of HCl and want to make 250ml of a 1.0 M solution, how many mL of the 3.0 M solution do I need?
2. A chemist starts with 50.0 mL of a 0.40 M NaCl solution and dilutes it to 1000. mL. What is the concentration of NaCl in the new solution?

Use the blank side of the paper you picked up to ...

Draw and label a **detailed** diagram of water boiling.

Under the diagram explain what is happening when water boils.

# Activity ...

Does water have to be 100 degrees Celsius to boil?