

# SPRING FINAL EXAM REVIEW

## 2<sup>nd</sup> SEMESTER TOPIC IDENTIFICATION REVIEW POSTERS

### \*Disclaimer\*

These posters were edited by students in class – there may be incorrect information on these posters. If you notice anything incorrect please let your teacher know so they can try and update the photo.

Chapter 9: Gas Laws

- Kelvins - Absolute 0; <sup>necessary</sup> 0°C = 273K
- Ideal Gases vs. Real Gases <sup>high temp. + low pressure</sup>
- ★ Dalton's Law of Partial Pressures  
 $P_{\text{Total}} = P_1 + P_2 + P_3 \dots$
- ⊕ Gas Stoichiometry
  - Basic Gas Law
  - STP - 273K, 1atm  
<sup>Standard temp and pressure</sup>  
→ mole fractions
  - gA ↔ mol A ↔ mol B  
gB

Boyle's, Charles', Gay-Lussac's, Avogadro's, Combined

Boyle's:  $P_1 V_1 = P_2 V_2$

Charles':  $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Gay Lussac's:  $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

Avogadro's:  $\frac{n_1}{V_1} = \frac{n_2}{V_2}$

combined:  $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

Ideal Gas Laws →  $PV = nRT$

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Chapter 10: Thermochemistry

- Specific Heat:  $J/g^{\circ}C$ ,  $kJ/g^{\circ}C$
- Heating/Cooling Curves
- $Q = mC\Delta T$ 
  - $Q$ : heat (J or kJ)
  - $m$ : mass (g or kg)
  - $C$ : specific heat ( $J/g^{\circ}C$  or  $kJ/g^{\circ}C$ )
  - $\Delta T$ : change in temperature ( $T_{final} - T_{initial}$ )
- 1<sup>st</sup> Law of Thermodynamics
  - $mc\Delta T = -\Delta mc\Delta T$  (means opposite)
- \* Calorimetry  $\rightarrow Q = -Q_c$
- \* Mixed-Phase Calorimetry
  - use Latent Heat
  - use - value for  $L$  if needed
- Heating Curve
- Latent heat

$Q = mc\Delta T$   
 $c_{ice} = 2.09 J/g^{\circ}C$   
 $Q = mL$   
 $L_{fusion} = 334 J/g$   
 $Q = mc\Delta T$   
 $c_{water} = 4.18 J/g^{\circ}C$   
 $Q = mL$   
 $L_{fusion} = 2260 J/g$



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**Chapter II: Solutions**

**Molarity** =  $\frac{\text{moles}}{L}$

**Solubility** - temp inc. solubility

**Solute** - substance that does the dissolving

**Solvent** - substance that does the dissolving

**Colloids** - milk, makeup, whipped cream, mayo

**Saturation** - unsaturated, saturated, supersaturated

**Other concentration units** - ppm, g/L, % mass

**Dilution** -  $M_1 V_1 = M_2 V_2$

**Other Calculations:**

ppm =  $\frac{g \text{ of solute}}{g \text{ of solution}} \times 1,000,000$

% comp =  $\frac{g \text{ of solute}}{g \text{ of solution}} \times 100$

Mole Fraction =  $X_A = \frac{n_A}{n_A + n_B}$

Grams/Liter =  $\frac{\text{mass of solute}}{\text{volume of solution}}$

**Dissociation vs Dissolving**

ionic compounds  
ionic bonds disrupted by solvent water  
breaks into ions

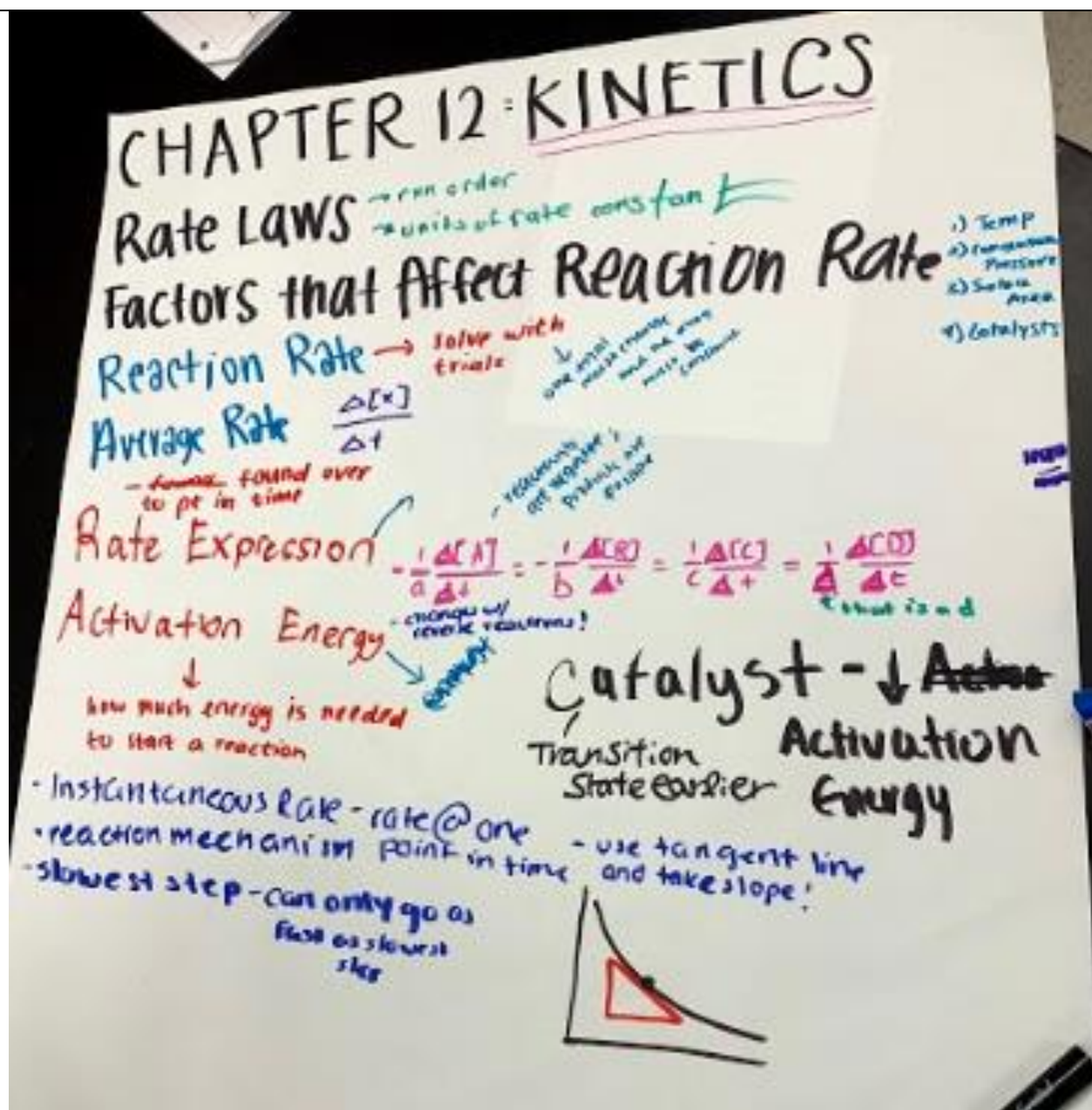
**Other**

**Bro**

**LL**

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### Ch 13 Equilibrium

- reversible reactions
  - equilibrium means both sides are going at same rate
  - forward and backward  $\rightleftharpoons$
- Le Chatelier's Principle
  - the reaction changes according to the stress
  - counters the applied stress
  - solids & liquids don't factor into eq.
- calculating  $K_{eq}$
- ICE TABLES
 

	$N_2$	$O_2$	$NO_2$
Initial	5	3	2
Change	-x	+x	+x
Equilibrium	5-x	3+x	2+x
- Equilibrium Constant  $K_{eq} = \frac{[\text{products}]}{[\text{reactants}]}$
- Q value
  - compare w/  $K_{eq}$  to find which side is favored
  - $Q > K$  = products,  $Q < K$  = reactants
- 5% Rule
  - use  $\frac{[x]}{\text{Initial}} \times 100 \leq 5\%$  if it applies
  - check at the end of the ICE table to see if it applies
- Reversible rxns
- Temperature changes both equilibrium and  $K_{eq}$

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### CHAPTER 14 ACIDS & BASES

**pH:** acids 1 - 6 p<sub>H</sub> = -log[H<sup>+</sup>]  
bases 7 - 14 p<sub>H</sub> = -log[OH<sup>-</sup>]

**weak vs. strong**

**neutralization** - produces water & salt + H<sub>2</sub>O

→ must be neutral, decolor, or heat

**Salts hydrolyzing**

$$K_a = \frac{K_w}{K_b}$$

**K<sub>a</sub> and K<sub>b</sub>**

$$K_w = K_a \cdot K_b$$

**ionization**

$$K_b = \frac{K_w}{K_a}$$

**pOH**

**[OH<sup>-</sup>] [H<sup>+</sup>] calculation**

$[H^+] = 10^{-10}$   
 $[OH^-] = 10^{-4}$

**Titration**



Burette

Titrant

→ known concentration

Titrand

(Analyte)

→ unknown concentration

**- nomenclature:**

- oxyanions: root of ion + ic + acid

- binary acids: hydro + root of ion + ic acid

**Strong Acids**

HCl  
HBr  
HI  
HNO<sub>3</sub>  
H<sub>2</sub>SO<sub>4</sub>  
HClO<sub>4</sub>

**Strong Bases**

LiOH  
NaOH  
KOH  
RbOH  
CsOH  
Ba(OH)<sub>2</sub>  
Sr(OH)<sub>2</sub>  
Ca(OH)<sub>2</sub>  
Mg(OH)<sub>2</sub>

$K_w = 10^{-14}$  at 25°C (for water)

**conjugate acids/bases:**  
act as acids/bases in reverse

**WA/WB: strong conj**

**SA/SB: weak conj.**

create neutral effect

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Common Mistakes,  
Warnings, tips, etc...

- Calculator mistakes → put parentheses
- Algebra mistakes → Double negatives
- Careful of units  $\begin{matrix} L \rightarrow mL \\ mL \rightarrow L \end{matrix}$   $\begin{matrix} K & H & D & B & D & C & M \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 10^3 & 10^2 & 10^1 & 10^0 & 10^{-1} & 10^{-2} & 10^{-3} \end{matrix}$
- Know your ions! →  $\begin{matrix} \text{strong bases} \\ \text{weak acids} \end{matrix}$
- Forgetting Negatives →  $-\log()$  → Remember equations
- Don't forget your concepts!!

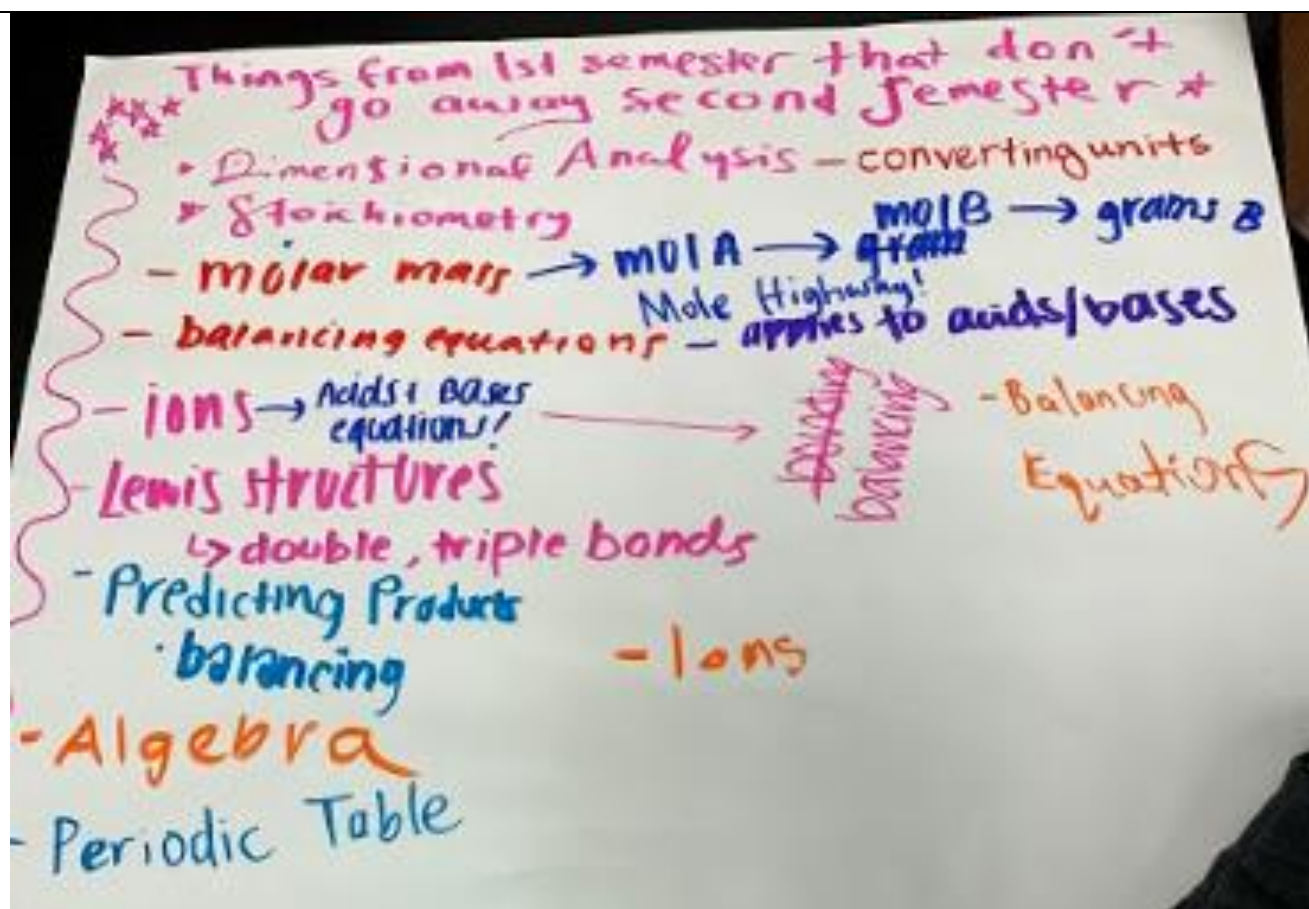
Also study

Know what the question is asking  
(Mark up the?)



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Common Mistakes  
(warnings, tips)

Calculator  
all of the above  
Don't forget units

Be careful with negative signs

make sure to know what the question is asking

check work

- in ice tables check

the 5% rule works -  $\frac{[C]_{\text{eq}}}{[C]_{\text{initial}}} \times 100 \leq 5\%$

- in stoich. write down the chemical eq.

Make sure to convert to right units

Memorize ions, states A/O, etc. - don't use solids!

- Be careful w/ parentheses liquids in ICE tables.

- check acids for monoprotic/polyprotic

- check the # of OH's in bases cuz mole fractions MATTER : check H's

- check units.

Be careful while using calculator

DON'T Overthink IT

read problems carefully to see

asking for moles or grams

- cross over

↳ neutralize ions

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### Things from Semester 1 + 2

- Stoichiometry
- metric conversions
- dimensional analysis
- mole ratios/molar mass
- balancing reactions \*
- mole highway

covalent/  
ionic  
bonds  
formulas

**IONS**  
atoms / elements

- Limiting Reagents
- Periodic Trends

Types of reactions,  
Predicting products,  
Valence electrons

Limiting  
reagents

- Theoretical yield  
& % error





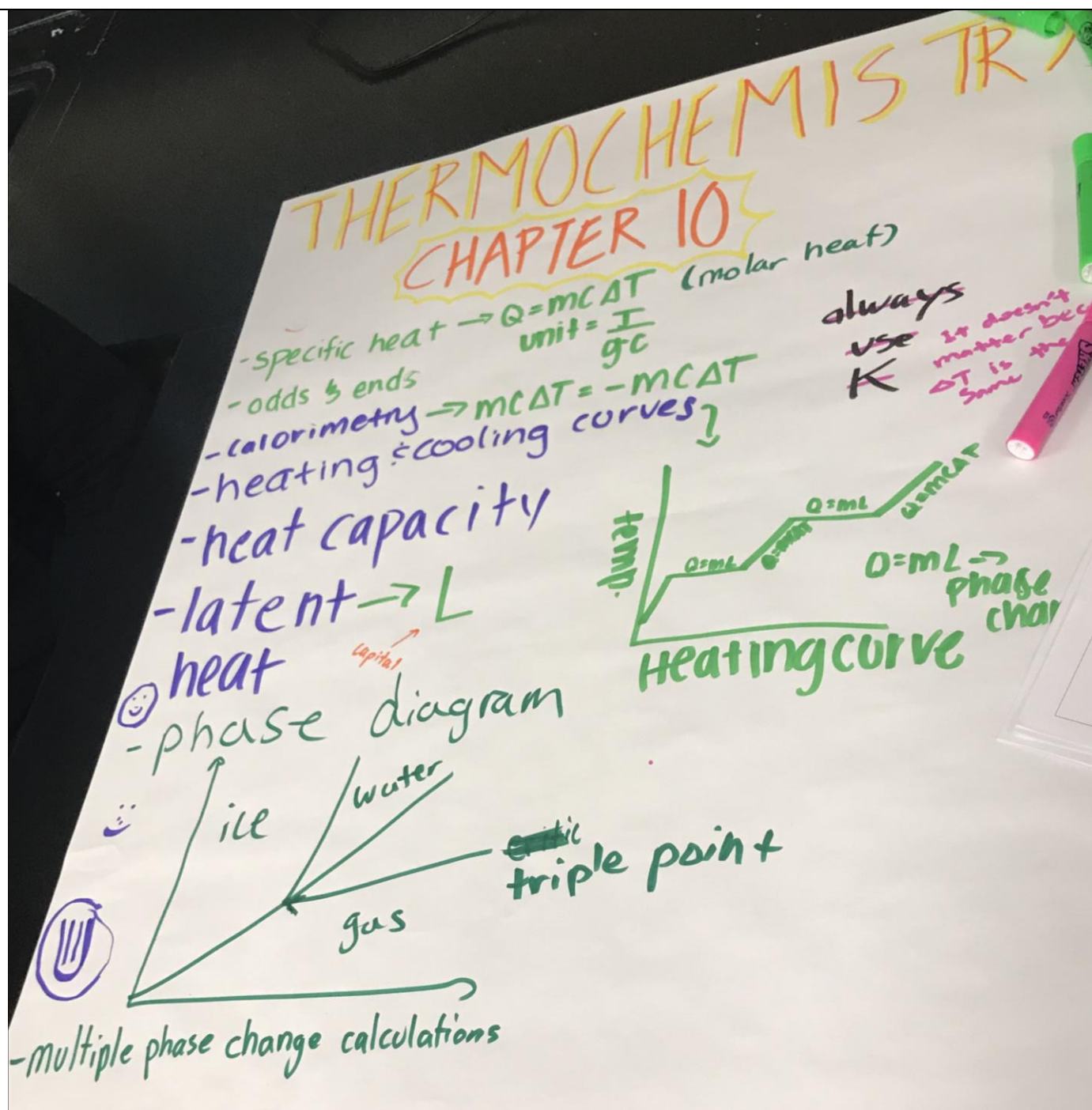
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**CHAPTER 9  
GAS LAWS**

- $PV = nRT$
- Kelvins =  $273 + ^\circ C$
- Basic Gas Laws
- Partial Pressure  
 $P_{\text{total}} = P_1 + P_2 + P_3 \dots$
- Boyle's law, Charles's law, Gay Lussac's law  
 $P_1 V_1 = P_2 V_2$   
 $\frac{V_1}{T_1} = \frac{V_2}{T_2}$   
 $\frac{P_1}{T_1} = \frac{P_2}{T_2}$
- Avogadro's law, combined gas laws  
 $\frac{V_1}{n_1} = \frac{V_2}{n_2}$   
 $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$
- Kinetic Molecular Theory
- Ideal Gas Constant  
 $R = 0.0821 \frac{\text{L} \cdot \text{atm}}{\text{K} \cdot \text{mol}}$
- Collecting Gas over Water
- Units & Conversions (atm, psi, Pa, kPa, torr, mmHg, K,  $^\circ C$ ,  $^\circ F$ , ...)
- mole highway
- Gas Stoichiometry



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## Chapter 11: Solutions

- solutes = substance being dissolved
- solvents = thing that something is dissolved into
- parts per million ( $\frac{\text{mass}}{\text{total mass}} \times 1,000,000$ )
- % composition ( $\frac{\text{mass}}{\text{total mass}} \times 100$ ) (it is  $\frac{\text{mass of solute}}{\text{solvent}}$ )
- molarity (mol/L)
- grams/liter

- dilutions  $M_1V_1 = M_2V_2$

- Saturated vs. Unsaturated

↳ unstable  
↳ water surrounding molecules  
Supersaturated

- dissolving vs. dissociating

↳ breaking up molecules

- increase the rate of solubility/dissolving

Solids - increase temp

- Stir

- Crush

gas - increase pressure  
- decrease temp



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# KINETICS Ch. 12

- Rate laws  $\text{rate} = k[A]^x[B]^y$

- Finding orders for rate laws

~~- Gas phase~~

- Catalysts

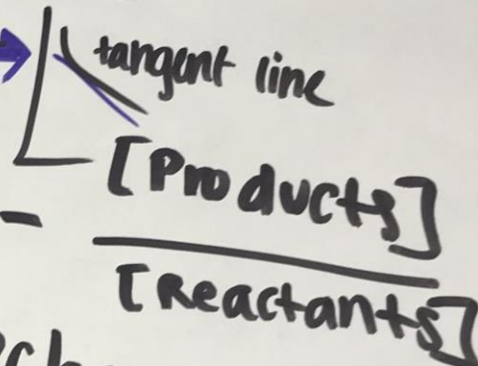
- Instantaneous

Set one [ ] constant

~~Average rate~~

- rate expression

decrease activation energy



- reaction mechanism

- rate determining slowest

- reaction rates are (M/s)

$$\frac{\Delta \text{concentration}}{\Delta \text{Time}}$$

Average reaction rates

Slope formula between two points



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### Chapter 13: Equilibrium

— Ice Tables

— Le Chatelier's Principle

$$K = \frac{[\text{product}]}{[\text{reactant}]}$$

~~reversible reactions~~  
reversible reactions

↳ if a stress is applied to a reaction at equilibrium then the reaction changes to relieve stress

—  $K_a/K_b/K_c/K_{sp}$  values  
( $K_a/K_b/K_c/K_{sp}$ )

↳ if the pressure increases, it shifts to the side to the side with fewer moles of gas

— ICE TABLES Steps

— Equilibrium Quotient

Reaction Initial

Concentration

Equilibrium

5%

Answer

1,000x smaller

in initial [ ]




• Equilibrium Stressors

— Temp. — Pressure (gas)

— concentrations —

$$K = \frac{[C][D]}{[A][B]}$$

← check using  $\frac{(X)}{(\text{initial})} - 100$

doesn't mean reaction stops, just that rates going → and ← are the same

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### Acids And Bases

properties + types of Acids and Bases  
Weak v.s. Strong Acids and Bases

PH calculations  
Titrations  
POH calculations  
Self-ionization of water

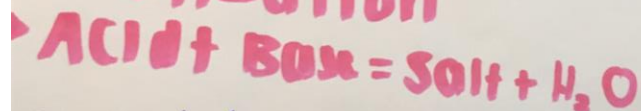
- Hydrolyzation  
- Salts

$$pH + pOH = 14$$

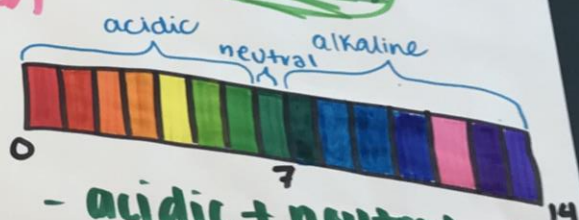
$$[H^+][OH^-] = 1 \times 10^{-14}$$

$$pH \text{ or } pOH = -\log([H^+] \text{ or } [OH^-])$$

Neutralization



Strong acids/bases ionize completely



- acidic + neutral = Acid
- Basic + neutral = basic
- neutral + neutral = neutral