**Chemistry Notes**

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**Connor Sin-Chan**

[**Nomenclature**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.7mvpq2hnvs9)—**none** except for recognizing ABS by formula

[**Thermochemistry**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.wkmtxvldteqe)

* Phase changes S 🡪 L 🡪 G
* Names of physical changes
* Types of chemical changes
* Endo and exo physical changes
* Endo and exo chemical changes
* Exo changes = combustion, neutralization, fermentation, A to water, B to water, composting, digestion= memorize these!!
* [Heating curves](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.wjlxbyaai0w0) and cooling curves

Adding heat will increase the T of a substance until it starts to melt or vaporize = ↑**Ek**

Adding heat to a substance at the melting point or boiling point will cause a phase change = **↑Ep**

**Hot and Cold Mixing Problems**

Sketch a quick Hot versus Cold table

-Q = + Q

**-mHcHΔTH = +mcccΔTc**

When doing these problems:

* Rearrange to solve for the variable you are asked for
* If asked for an initial TH or a TC solve for ΔTH or ΔTC first
* then use **ΔT = Tf- Ti separately!!!!!!**
* If asked for Tf then following formula:

**Tf** = (**mHcHTTH + mcccTc) / (mHcH + mccc)**

**Calorimetry:**

Q = mcΔT and

ΔH = Q/n

ΔH = BER – BEP

ΔH = HP - HR

**Exothermic and Endothermic Reactions**

* Thermochemical equations
* **ΔH** notation
* Graphs

* Be able to label HP and HR and ΔH and activation energy forward and reverse rxns on graphs!!!!!!

ΔHsolution-4 step/reverse 4 step

ΔHneutralization-4 step/reverse 4 step

ΔHreaction-4 step/reverse 4 step

ΔH combustion etc etc

ΔH formation – 4 step/reverse 4 step

**Hess’ Law**

* Long way
* “Fast Way” only if you only have Heats of Formation—does not work with anything other than heats of formation

**Rates of Reactions (Kinetics)**

Collision Theory--memorize

Factors that Affect the Rate (increase the number of collisions)

* The 5 factors
* How they affect a rate

How to write a rate of reaction:

**Rate = change in concentration of R or P/time!!!!!**

Can be other changes in the numerator e.g. change in mass.

There is always a time component in the denominator!!!! Always!!

Find the rate of reaction in terms of a R or P given information about the particular R or P in asked for units—watch which units!

Find the rate of a reaction in terms of a different R or P from the information given—will involve stoichiometry i.e. the mole ratio.

**Rate Law**

For: 2 A(aq) + B(aq) 🡪 3 C(aq)

**Rate = k [A]x[B]y**

* only involves reactants
* only gases and aqueous solns can experience a concentration change so S and L are not included
* Law of mass action way right from BCE = coefficients become the exponents
* Real way from **data table** with experimental evidence—determine the exponents from the data

**Equilibrium (Dynamic)**

**Systems at Equilibrium**

* System must be closed = no R or P in or out
* A saturated soln is considered closed
* The rate of the forward reaction = the rate of the reverse reaction
* Constant macroscopic properties

[**Le Chatelier’s Principle**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.so5xe637bfc4)

* Stress
* Want
* Shift

Therefore what happens to the concentrations of R and P – up or down????

**Stresses:**

* Change in concentration up or down of R or P
* Change in P (change in V) only affects systems with gases
* Change in P by adding or subtracting gases
* Change in P by adding a non-reacting gas
* Change in **T** up or down = **change in the value of Keq**

[**RICE Tables**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.2yzho2r05l6n)

Viewing equilibrium equations i.e. BCE—pay attention to the subscripts!

Writing equilibrium expressions

**Keq = [P]/[R]**

Only the concentration of gases and aqueous solutions can be changes therefore no S or L are included in Keq!

[**Acids, Bases and Salts**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.d4j6jg362rh3)

* pH scale based on water at 25 oC
* SA versus WA
* SB versus WB
* Acidic, Basic and neutral salts exist
* Electrolytes = ABS dissolved in water to form ions
* More ions = increased electrical conductivity
* [Arrhenius Definitions](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.cn2bcd8ep7a3)
* [Bronsted-Lowry Definitions](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.go6bkxrv90m0) = A/CB and B/CA
* [pH and pOH](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.ccz2u5igccnv)
* [H+] and [OH-] calculations
* [HA] calculation
* [HB] calculation
* [Kw of Water](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.k8lf3w2f3dft) at 25 oC
* Percent ionization
* Equation for the ionization of an acid
* Ka expression/acidity constant for the ionization of an acid
* Ranking A in order of strength using Ka or percent ionization (NOT pH)
* Equation for the dissociation of a base
* Kb expression for the dissociation of a base
* RICE tables for A or B that split up
* Neutralization reactions

**nBCAVA = CBVBnA**

[**Solubility**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.z4tnfl9x2zva)

* [Rules of Solubility (in a water solution)](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.n1guepshmmeb)
* Using a solubility table
* Writing the equation for a salt or base dissolving in water
* Writing the Ksp expression for a salt or base dissolving in water
* Using solubility in mo/L to solve for Ksp = type 1
* Using Ksp to solve for solubility in mol/L or g/L or mg/mL etc = type 2

[**Gases**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.fxtk5ao820ux)

* Pressure is caused by particles of gas hitting the sides of the container
* Temperature is a measure of the average kinetic energy of the particles
* **PVnT**
* [Kinetic Molecular Theory of Ideal Gases](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.5t84t28cnz0y) – memorize!!
* [Variables in Gas Laws](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.nkiomabsmq0) = P and V and n and T
* **T always in K!!!!!!**
* [Pressure and Temperature Units in Gas Laws](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.6dej0bpafcco)

[**Gas Laws**](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.ax01bec3prv8)

**Be able to write all formulae!!**

* [Boyle’s Law](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.o8lej8y7w2lk)
* [Charles’ Law](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.4dnz8ho9szgc)
* [Avogadro](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.twh6xjpva1wf)
* [Gay-Lussac’s Law of Combining volumes of gases:](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.tviku0lpys1q)
* [General Gas Law](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.i3qrx3yts9ci)
* [Ideal Gas Law](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.9y6bgd7locw6)
* [Graham’s Law](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.wu07wuqm9wo3)
* [Dalton’s Law of Partial Pressures](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.bc0mjl7kc1vx)
* Open-ended and close-ended [Manometers](https://docs.google.com/document/d/1n0jzmPdR1pc75w2983OxBxvqregPQ4TegmtT_kgL8sA/edit#heading=h.enx8x2nfldtv)
* Barometers
* T is a measure of the average kinetic energy of the particles
* P is caused by the number of particles hitting the sides of the container
* If P, V and T are the same then the number of moles n of gas are the same!