

General Resources:

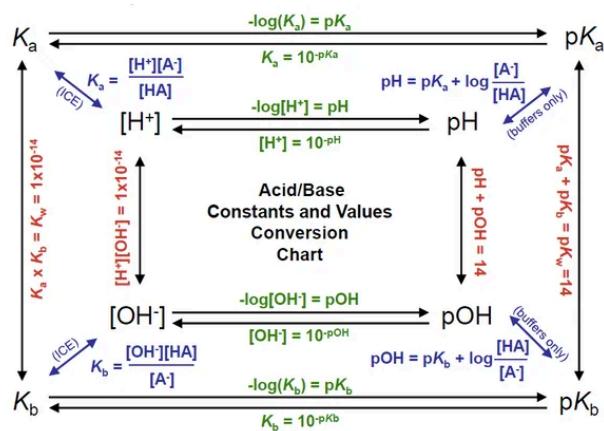
<https://www.youtube.com/@NinjaNerdOfficial>

Gen Chem:

Crash Course:

<https://www.youtube.com/watch?v=uVFCOfSuPTo&list=PL8dPuuaLjXtPHzzYuWy6fYEaX9mQQ8oGr>

- Acid-Base reactions



Practice Questions:

<https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:acids-and-bases/x2eef969c74e0d802:acidbase-reactions/e/acid-base-reactions>

- pH equation

How to Calculate pH

pH is the negative base 10 logarithm of hydrogen ion concentration

$$pH = -\log[H^+]$$

$$pH = -\log[H_3O^+]$$

$$pH = pK_a + \log([A^-]/[HA])$$

$$\text{For a strong acid: } pH = -\log[HA]$$



sciencenotes.org

Videos:

How to calculate without a calculator

<https://www.youtube.com/watch?v=Mqph6gmluwg>

General Video

<https://www.youtube.com/watch?v=OEW4-Sfyvik>

- Gibbs free energy equation

| Gibbs Free Energy | | | |
|-------------------|------------|------|------------|
| ΔH | ΔS | T | ΔG |
| + | + | High | - |
| - | - | Low | - |
| - | + | All | - |
| + | - | All | + |

$\Delta G = \Delta H - T\Delta S$

$\Delta G^\circ = -RT \ln K$

$K = e^{-\Delta G^\circ / RT}$

Video:

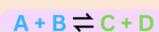
General Overview

<https://www.youtube.com/watch?v=2KuNzB0cZL4>

- Le Chatlier's Principle

Le Chatelier's Principle

Disturbing a system at dynamic equilibrium shifts the equilibrium in the direction that counteracts the change.



Concentration

↑ reactant concentration
↑ favors product formation

↑ product concentration
↑ favors reactant formation

Temperature

↑ temperature
favors endothermic reaction

↓ temperature
favors exothermic reaction

Pressure

↑ pressure
favors side with fewer molecules

↓ pressure
favors side with more molecules

sciencenotes.org

Videos:

General Overview

<https://www.youtube.com/watch?v=bNcTt3l3Q8k>

Menomics:

The elements that are diatomic gases at standard conditions:

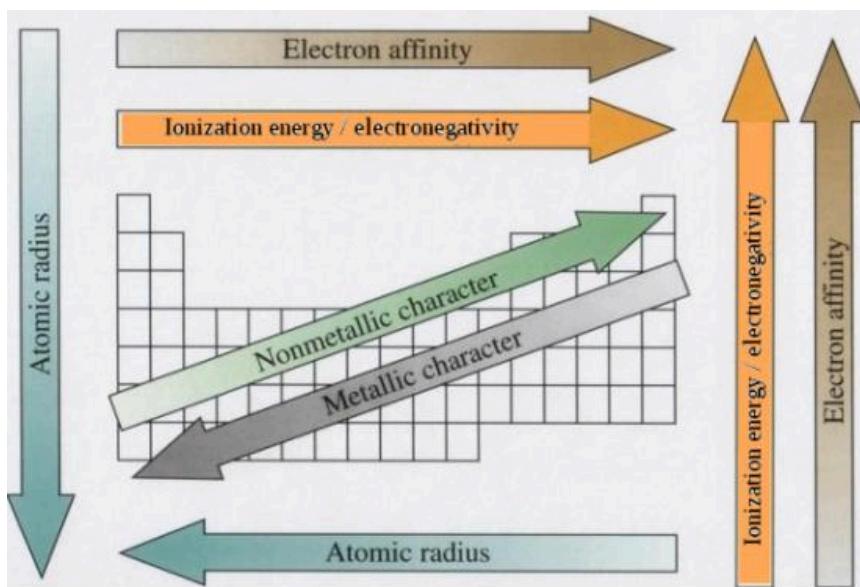
Have No Fear Of Ice Cold Beer

(H₂ N₂ F₂ O₂ I₂ Cl₂ Br₂)

or

"huh-noff cull-bree": H₂ N₂ O₂ F₂ Cl₂ Br₂ I₂

- Periodic Trends



Videos:

General Overview

<https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:atomic-structure-and-properties/x2eef969c74e0d802:periodic-trends/v/periodic-trends-and-coulombs-law>

Physics:

Crash Course Videos:

https://www.youtube.com/watch?v=OoO5d5P0Jn4&list=PL8dPuuaLjXtN0qe7yDk_UA0IdZJdhwkoV

- Every equation

| | | | | | |
|--|--|---|---|---|--|
| Kinematics $d = \frac{1}{2}(V_0 + V_f)t$ $d = V_0t + \frac{1}{2}at^2$ $V_f = V_0 + at$ $V_x^2 = V_0^2 + 2ad$ $V_{0x} = V_0 \cos\theta$ $V_{0y} = V_0 \sin\theta$ Force, etc $F = ma$ $F_f = \mu_s F_N$ $F_f = \mu_k F_N$ $F = F_{\text{cent}}$ $F = F_{\text{grav}}$ $F_c = \frac{GMm}{r^2}$ $F_{\text{parallel}} = mg \cos\theta$ $F_{\text{perpendicular}} = mg \sin\theta$ $F_c = \frac{mv^2}{r}$ $a_c = \frac{v^2}{r}$ Work, Energy, and Power $W = Fd \cos\theta$ $KE = \frac{1}{2}mv^2$ $PE_{\text{grav}} = W_{\text{from gravity}} = mg\Delta h$ $W = \Delta KE = KE_f - KE_i$ $P = \frac{W}{t}$ $P = Fvcos\theta$ $\dot{P} = mv$ $J = \Delta P = \Delta(mv) = F\Delta t$ $MA = \frac{F_{\text{resistance}}}{F_{\text{effort}}}$ $Eff (\%) = \frac{W_{\text{output}}}{W_{\text{input}}}$ $Elastic Collision$ $v_{i,x} + v_{i,y} = v_{f,0} + v_{f,y}$ | Charges and Electric Fields $Coulomb's Law$ $F_e = k q_1 q_2 $ $EPE_{\text{elec}} = \frac{kq_1 q_2}{r}$ $Magnitude of Electric Field$ $E_e = k q $ Forces and Electric Fields $F_{\text{friction}} = \mu_s F_N$ $F_{\text{normal}} = \mu_k F_N$ A $X_{\text{CM}} = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3 + \dots}{m_1 + m_2 + m_3 + \dots}$ $F_{\text{grav}} = GMm$ $F_{\text{parallel}} = mg \cos\theta$ $Torque$ $T = rF \sin\theta / lF$ $F_c = \frac{mv^2}{r}$ $a_c = \frac{v^2}{r}$ Work, Energy, and Power $W = Fd \cos\theta$ $KE = \frac{1}{2}mv^2$ $PE_{\text{grav}} = W_{\text{from gravity}} = mg\Delta h$ $Conduction$ $P_{\text{cond}} = \frac{\Delta Q}{\Delta t} = -kA \frac{\Delta T}{\Delta x} = kA \frac{T_1 - T_2}{L}$ $First Law of Thermodynamics$ $\Delta E = Q - W$ $Linear Thermal Expansion$ $\Delta L = \alpha L_0 \Delta T$ $Thermodynamic Work$ $W = P\Delta V$ | Light, Optics, and Quantum Physics $n = \frac{c}{v}$ $Snell's Law$ $n_1 \sin\theta_1 = n_2 \sin\theta_2$ $Critical Angle for Total Internal Reflection$ $\sin\theta_{\text{crit}} = \frac{n_2}{n_1}$ $Mirror and Lens Equation$ $\frac{1}{o} + \frac{1}{i} = \frac{1}{f}$ $Magnification Equation$ $m = -\frac{i}{o}$ Index of Refraction $E = hf = hc/\lambda$ $Energy Level of a Hydrogen Atom$ $E_n = -\frac{13.6 \text{ eV}}{n^2}$ Photons $E_{\text{photon}} = hf = \Delta E_{\text{atom}} = \frac{1}{n_{\text{final}}^2} - \frac{1}{n_{\text{initial}}^2}$ Heisenberg Uncertainty Relation $\Delta x \Delta p \geq \frac{\hbar}{2\pi}$ | | | |
| $W = Fd \cos\theta$ $KE = \frac{1}{2}mv^2$ $PE_{\text{grav}} = W_{\text{from gravity}} = mg\Delta h$ $W = \Delta KE = KE_f - KE_i$ $P = \frac{W}{t}$ $P = Fvcos\theta$ $\dot{P} = mv$ $J = \Delta P = \Delta(mv) = F\Delta t$ $MA = \frac{F_{\text{resistance}}}{F_{\text{effort}}}$ $Eff (\%) = \frac{W_{\text{output}}}{W_{\text{input}}}$ $Elastic Collision$ $v_{i,x} + v_{i,y} = v_{f,0} + v_{f,y}$ | $F = ma$ $F_f = \mu_s F_N$ $F_f = \mu_k F_N$ $F = F_{\text{cent}}$ $F = F_{\text{grav}}$ $F_c = \frac{GMm}{r^2}$ $F_{\text{parallel}} = mg \cos\theta$ $F_{\text{perpendicular}} = mg \sin\theta$ $F_c = \frac{mv^2}{r}$ $a_c = \frac{v^2}{r}$ Work, Energy, and Power $W = Fd \cos\theta$ $KE = \frac{1}{2}mv^2$ $PE_{\text{grav}} = W_{\text{from gravity}} = mg\Delta h$ $Conduction$ $P_{\text{cond}} = \frac{\Delta Q}{\Delta t} = -kA \frac{\Delta T}{\Delta x} = kA \frac{T_1 - T_2}{L}$ $First Law of Thermodynamics$ $\Delta E = Q - W$ $Linear Thermal Expansion$ $\Delta L = \alpha L_0 \Delta T$ $Thermodynamic Work$ $W = P\Delta V$ | Circuits $Ohm's Law$ $V = IR$ $Power$ $P = IV = I^2R$ $Energy Stored in a Capacitor$ $PE = \frac{1}{2}QV$ Resistance $R = \rho \frac{L}{A}$ $Equivalent Resistance$ $Series$ $R_{\text{eq}} = R_1 + R_2 + \dots$ $Parallel$ $\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$ $AC Average Power Supplied$ $\bar{P} = I_{\text{rms}} V_{\text{rms}}$ Capacitance $C = \frac{Q}{V} = \frac{K\varepsilon A}{d}$ $Total Capacitance$ $Series$ $\frac{1}{C_{\text{eq}}} = \frac{1}{C_1} + \frac{1}{C_2} + \dots$ $Parallel$ $C_{\text{eq}} = C_1 + C_2 + \dots$ AC Average Power Dissipated $P = I_{\text{rms}}^2 R$ | Fluids $Specific Gravity$ $\text{sp. gr.} = \frac{\rho}{\rho_{H_2O}}$ $Flow Rate$ $F = Av$ $Continuity Equation$ $A_1 v_1 = A_2 v_2$ Forces of Gravity $F_{\text{grav}} = \rho V g$ Hydrostatic Gauge Pressure $P_{\text{gauge}} = \rho h d g$ Torricelli's Result $v_{\text{efflux}} = \sqrt{2gh}$ Bernoulli Equation $P_1 + \frac{1}{2}\rho V_1^2 + \rho g y_1 = P_2 + \frac{1}{2}\rho V_2^2 + \rho g y_2$ | | |
| $Frequency$ $f = \frac{1}{T}$ $Period$ $T = \frac{1}{f}$ Simple Harmonic Motion of Spring $Frequency$ $f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$ $Period$ $T = 2\pi \sqrt{\frac{m}{k}}$ Simple Harmonic Motion of Pendulum $Frequency$ $f = \frac{1}{2\pi} \sqrt{\frac{g}{l}}$ $Period$ $T = 2\pi \sqrt{\frac{l}{g}}$ | Elastic Potential Energy $PE_{\text{elastic}} = \frac{1}{2}Kx^2$ Doppler Effect $f_o = f_s \frac{V + V_o}{V + V_b}$ Work (Spring) $W_{\text{spring}} = \Delta PE_{\text{elastic}}$ $W_{\text{spring}} = \Delta PE_{\text{elastic}}$ Force Exerted by Spring $F = -kx$ Standing Wave (Closed Pipe) $\lambda_n = \frac{4L}{n}$ $f_n = \frac{nv}{4L}$ Standing Wave (Fixed Ends and Open Pipe) $\lambda_n = \frac{2L}{n}$ $f_n = \frac{nv}{2L}$ | Angular Motion Angular Velocity $\omega = \frac{\Delta \theta}{\Delta t}$ Intensity Level $\beta = 10 \log_{10} \frac{I}{I_0}$ Beat Frequency $f_{\text{beat}} = f_1 - f_2 $ Magnitude of Acceleration $\alpha = \frac{\Delta \omega}{\Delta t} = \frac{T}{I}$ Moment of Inertia $I = mr^2$ $Point Mass$ $I = \frac{1}{12}ml^2$ $Cylinder$ $I = \frac{1}{2}mr^2$ $Rod with Axis at End$ $I = \frac{1}{3}ml^2$ $Sphere$ $I = \frac{2}{5}mr^2$ Rotational Kinetic Energy $KE_{\text{rot}} = \frac{1}{2}I\omega^2$ Velocity of Center of Mass Rolling Without Slipping $v_{CM} = R\omega$ Angular Momentum $L = mvr \sin\theta = mR\omega^2 R = I\omega$ | Angular Motion Angular Velocity $\omega = \frac{\Delta \theta}{\Delta t}$ Intensity Level $\beta = 10 \log_{10} \frac{I}{I_0}$ Beat Frequency $f_{\text{beat}} = f_1 - f_2 $ Magnitude of Acceleration $\alpha = \frac{\Delta \omega}{\Delta t} = \frac{T}{I}$ Moment of Inertia $I = mr^2$ $Point Mass$ $I = \frac{1}{12}ml^2$ $Cylinder$ $I = \frac{1}{2}mr^2$ $Rod with Axis at End$ $I = \frac{1}{3}ml^2$ $Sphere$ $I = \frac{2}{5}mr^2$ Rotational Kinetic Energy $KE_{\text{rot}} = \frac{1}{2}I\omega^2$ Velocity of Center of Mass Rolling Without Slipping $v_{CM} = R\omega$ Angular Momentum $L = mvr \sin\theta = mR\omega^2 R = I\omega$ | Stress and Strain Hooke's Law $\text{stress} = \text{modulus} \times \text{strain}$ Tensile and Compression $\text{Strain} = \frac{\Delta L}{L_0}$ $\Delta L = \frac{FL_0}{EA}$ Shear $\text{Strain} = \frac{X}{L_0}$ $X = \frac{FL_0}{AG}$ | Units General Overview of how they connect https://www.youtube.com/watch?v=BQKYRVloRE8 |

Videos:

General Overview of how they connect

<https://www.youtube.com/watch?v=BQKYRVloRE8>

● Units

| SI Derived Units | | | | |
|--|---------|--------|---------------------------------------|---|
| Derived quantity | Name | Symbol | Expression in terms of other SI units | Expression in terms of SI base units |
| Frequency | Hertz | Hz | - | s ⁻¹ |
| Force | Newton | N | - | m·kg·s ⁻² |
| Pressure, stress | Pascal | Pa | N/m ² | m ⁻¹ ·kg·s ⁻² |
| Energy, work, quantity of heat | Joule | J | N·m | m ² ·kg·s ⁻² |
| Power, radiant flux | Watt | W | J/s | m ² ·kg·s ⁻³ |
| Electric charge, quantity of electricity | Coulomb | C | - | s·A |
| Electric potential difference, electromotive force | Volt | V | W/A | m ² ·kg·s ⁻³ ·A ⁻¹ |
| Capacitance | Farad | F | C/V | m ⁻² ·kg ⁻¹ ·s ⁴ ·A ² |
| Electric resistance | Ohm | Ω | V/A | m ² ·kg·s ⁻³ ·A ⁻² |
| Electric conductance | Siemens | S | A/V | m ⁻² ·kg ⁻¹ ·s ³ ·A ² |
| Magnetic flux | Weber | Wb | V·s | m ² ·kg·s ⁻² ·A ⁻¹ |
| Magnetic flux density | Tesla | T | Wb/m ² | kg·s ⁻² ·A ⁻¹ |
| Inductance | Henry | H | Wb/A | m ² ·kg·s ⁻² ·A ⁻² |

Video

Overview::

<https://www.youtube.com/watch?v=38xkmmT5bjE>

- Optics

| For BOTH mirror and lens: | | Lens only: |
|---|---|--|
| 1/f = 1/p + 1/q Obj: p= usually positive Img: +q= real; -q= virtual | M = -i/o +m = upright -m = inverted | power/strength: P=1/F Lens Systems: M _{tot} =M ₁ *M ₂ ... 1/f _{tot} =1/f ₁ +1/f ₂ +... P _{tot} =P ₁ +P ₂ ... |

| mirror | lens | For lens, use to correct: |
|----------------------|---------------------|---------------------------|
| Convex = diverging | Convex = converging | Hyperopia (far-sight) |
| Concave = converging | Concave = diverging | Myopia (near-sight) |

| Converging: f > 0 | | diverging : f < 0 |
|-------------------|---------------------------------|----------------------|
| | Image will be... | Image will ALWAYS be |
| F > obj | UV: upright, virtual (enlarged) | UV: upright, virtual |
| F = obj | No image | |
| Obj > f | IR: inverted, real | |

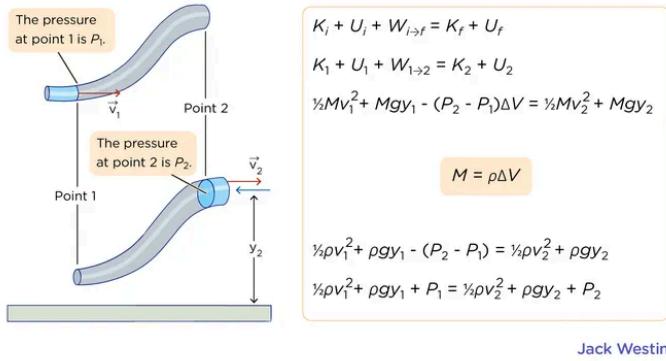
Mnemonic: UV → IR (UV comes first on EM spectra)

Overview:

<https://blog.blueprintprep.com/mcat/a-high-level-guide-to-high-yield-mcat-optics-concepts/>

- Fluids

Deriving Bernoulli's equation as Conservation of Energy



Jack Westin

Overview:

https://www.youtube.com/watch?v=gRRnalZ_v24

- Decay

| Alpha decay | |
|---|--|
| $A_Z X \rightarrow A_{-2} Z Y + A_2 \alpha$ | A - atomic mass Z - atomic number α - alpha particle (helium nucleus) |
| Beta-minus decay | |
| $A_Z X \rightarrow A_{Z+1} Y + A_0^- \beta$ | A - atomic mass Z - atomic number β^- - electron |
| Beta-plus decay | |
| $A_Z X \rightarrow A_{Z-1} Y + A_0^+ \beta^+$ | A - atomic mass Z - atomic number β^+ - positron |
| Gamma decay | |
| $A_Z X^* \rightarrow A_Z X + c$ | A - atomic mass Z - atomic number c - high energy radiation |
| Electron capture | |
| $A_Z X + e^- \rightarrow A_{Z-1} Y$ | A - atomic mass Z - atomic number |

Videos:

Overview:

<https://www.youtube.com/watch?v=IfHLiLBoWfg>

Psych/Soc:

Crash Course Videos:

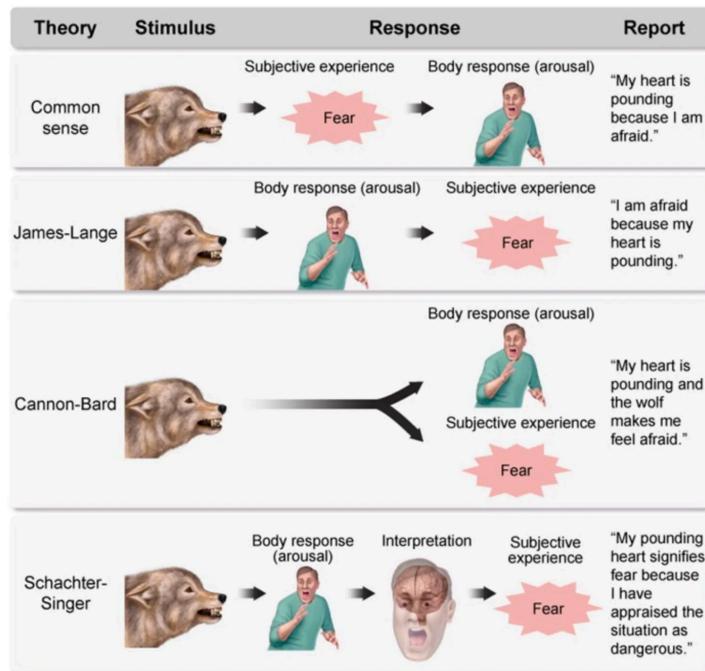
Psych:

<https://www.youtube.com/watch?v=eaI4-A89IWY&list=PL8dPuuaLjXtOPRKzVLY0jJY-uHOH9KVU6>

Soc:

https://www.youtube.com/watch?v=yIXVn-wh9eQ&list=PL8dPuuaLjXtMJ-AfB_7J1538YKWKzAnGA

- Emotion



Website Information:

<https://jackwestin.com/resources/mcat-content/emotion>

Videos:

<https://www.youtube.com/watch?v=TQ51Gsb98ec>

<https://www.youtube.com/watch?v=yIWKrQTznXc>

<https://www.youtube.com/watch?v=qOYCeAlukMk>

<https://www.youtube.com/watch?v=FkDVucEoJpU&t=5s>

- Stages of development

| Age | FREUD Libido tension | ERIKSON Conflicts | PIAGET How kids construct world | KOHLBERG Moral development |
|-----|---------------------------------------|---|---|--|
| 1 | Oral mouth | Trust v. Mistrust Hope | Sensorimotor Obj perm | Preconventional ① Avoid punishment ② Seek reward |
| 2 | Anal anus | Autonomy v. Shame Will | | |
| 3 | | | Pre-operational pretend play /egocentric | |
| 4 | Phallic genitals | Initiative v. Guilt purpose | | |
| 5 | | | | |
| 6 | | | | |
| 7 | Latent | Industry vs. Inferiority Competence | Concrete operational Conservation/math skills | Conventional ③ Conform ④ Follow the rules |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | Genital mature sexual interests | Identity v. role conf. Fidelity | Formal Operational moral reasoning/ abstract thinking | Post conventional ⑤ Do the right thing (even if it's against rules) ⑥ Universal ethical Standard |
| 14 | | | | |
| 15 | | | | |
| 20 | | Intimacy v. Isolation Love | | |
| 25 | | | | |
| 30 | | | | |
| 40 | | Generativity vs. Stagnation care | | |
| 50 | | | | |
| 60 | | | | |
| 70 | | Integrity v. Despair Wisdom | | |
| 80 | | | | |
| 90 | | | | |
| 100 | Old age parents love grapes | Hope will purposely Compete for love (smc) can't win. | Sorry (my) Poop Can't Flush | Avoid sea creatures from rivers upstate |

Piaget's Theory

| Stage | Age Range | Description |
|----------------------|------------|---|
| Sensorimotor | 0-2 years | Coordination of senses with motor response, sensory curiosity about the world. Language used for demands and cataloguing. Object permanence developed |
| Preoperational | 2-7 years | Symbolic thinking, use of proper syntax and grammar to express full concepts. Imagination and intuition are strong, but complex abstract thought still difficult. Conservation developed. |
| Concrete Operational | 7-11 years | Concepts attached to concrete situations. Time, space, and quantity are understood and can be applied, but not as independent concepts |
| Formal Operations | 11+ | Theoretical, hypothetical, and counterfactual thinking. Abstract logic and reasoning. Strategy and planning become possible. Concepts learned in one context can be applied to another. |

The Psychology Notes Headquarter - <http://www.PsychologyNotesHQ.com>

SOCIALISM...

Erikson's Stages of Psychosocial Development

| Approximate Age | Psychosocial Crisis/Task | Virtue Developed |
|---------------------|----------------------------|------------------|
| Infant - 18 months | Trust vs Mistrust | Hope |
| 18 months - 3 years | Autonomy vs Shame/Doubt | Will |
| 3-5 years | Initiative vs Guilt | Purpose |
| 5-13 years | Industry vs Inferiority | Competency |
| 13-21 years | Identity vs Confusion | Fidelity |
| 21-39 years | Intimacy vs Isolation | Love |
| 40-65 years | Generativity vs Stagnation | Care |
| 65 and older | Integrity vs Despair | Wisdom |

Jack Westin

Videos:

Piaget:

<https://www.youtube.com/watch?v=Jt3-PIC2nCs>

Eriksons:

<https://www.youtube.com/watch?v=SloKwUcmivk>

Kohlberg:

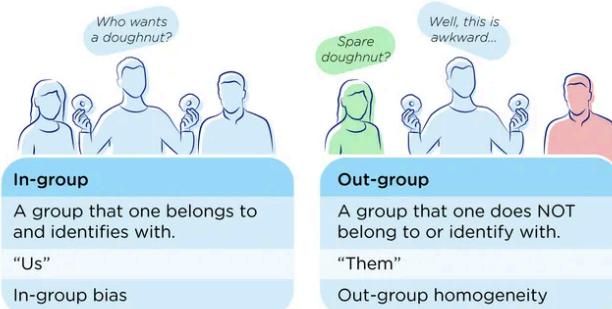
<https://www.youtube.com/watch?v=Onkd8tChC2A>

Freuds:

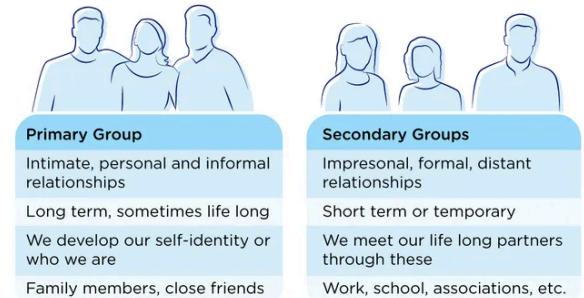
<https://www.youtube.com/watch?v=nG7yosFQHP4>

- group behavior

US versus THEM



Jack Westin



Jack Westin

Videos:

https://www.youtube.com/watch?v=wOw7LWCW_Zk

- Biases

20 COGNITIVE BIASES THAT SCREW UP YOUR DECISIONS

1. Anchoring bias.

People are **over-reliant** on the first piece of information they hear. In a salary negotiation, whoever makes the first offer establishes a range of reasonable possibilities in each person's mind.



2. Availability heuristic.

People **overestimate the importance** of information that is available to them. A person might argue that smoking is not unhealthy because they know someone who lived to 100 and smoked three packs a day.



3. Bandwagon effect.

The probability of one person adopting a belief increases based on the number of people who hold that belief. This is a powerful form of **groupthink** and is reason why meetings are often unproductive.



4. Blind-spot bias.

Failing to recognize your own cognitive biases is a bias in itself. People notice cognitive and motivational biases much more in others than in themselves.



5. Choice-supportive bias.

When you choose something, you tend to feel positive about it, even if that **choice has flaws**. Like how you think your dog is awesome — even if it bites people every once in a while.



6. Clustering illusion.

This is the tendency to **see patterns in random events**. It is key to various gambling fallacies, like the idea that red is more or less likely to turn up on a roulette table after a string of reds.



7. Confirmation bias.

We tend to listen only to information that confirms our **preconceptions** — one of the many reasons it's so hard to have an intelligent conversation about climate change.



8. Conservatism bias.

Where people favor prior evidence over new evidence or information that has emerged. People were **slow to accept** that the Earth was round because they maintained their earlier understanding that the planet was flat.



9. Information bias.

The tendency to **seek information when it does not affect action**. More information is not always better. With less information, people can often make more accurate predictions.



10. Ostrich effect.

The decision to **ignore dangerous or negative information** by "burying" one's head in the sand, like an ostrich. Research suggests that investors check the value of their holdings significantly less often during bad markets.



11. Outcome bias.

Judging a decision based on the **outcome** — rather than how exactly the decision was made in the moment. Just because you won a lot in Vegas doesn't mean gambling your money was a smart decision.



12. Overconfidence.

Some of us are **too confident about our abilities**, and this causes us to take greater risks in our daily lives. Experts are more prone to this bias than laypeople, since they are more convinced that they are right.



13. Placebo effect.

When **simply believing** that something will have a certain effect on you causes it to have that effect. In medicine, people given fake pills often experience the same physiological effects as people given the real thing.



14. Pro-innovation bias.

When a proponent of an innovation tends to **overvalue its usefulness** and undervalue its limitations. Sound familiar, Silicon Valley?



15. Recency.

The tendency to weigh the **latest information** more heavily than older data. Investors often think the market will always look the way it looks today and make unwise decisions.



16. Salience.

Our tendency to focus on the **most easily recognizable features** of a person or concept. When you think about dying, you might worry about being mauled by a lion, as opposed to what is statistically more likely, like dying in a car accident.



17. Selective perception.

Allowing our expectations to **influence** how we perceive the world. An experiment involving a football game between students from two universities showed that one team saw the opposing team commit more infractions.



18. Stereotyping.

Expecting a group or person to have certain qualities without having real information about the person. It allows us to quickly identify strangers as friends or enemies, but people tend to **overuse and abuse** it.



19. Survivorship bias.

An error that comes from focusing only on surviving examples, causing us to **misjudge a situation**. For instance, we might think that being an entrepreneur is easy because we haven't heard of all those who failed.



20. Zero-risk bias.

Sociologists have found that **we love certainty** — even if it's counterproductive. Eliminating risk entirely means there is no chance of harm being caused.



MCAT Attributional Biases

| | # of distinct groups | Primary person (in-group) | Other person (out-group) | Primary person attributes: |
|-------------------------------|----------------------|---------------------------|--------------------------|--|
| Self-serving bias | 1 | ✓ | | <ul style="list-style-type: none"> Their (primary) success to internal factors Their (primary) failures to external factors |
| Actor-observer bias | 2 | ✓ | ✓ | <ul style="list-style-type: none"> Primary person's behavior to external factors Other person's behavior to internal factors |
| Fundamental attribution error | 1 | | ✓ | Other person's behavior to internal factors |

- Internal factors = dispositional attribution (i.e., personality)
- External factors = situational attribution (i.e., environment)

Videos:

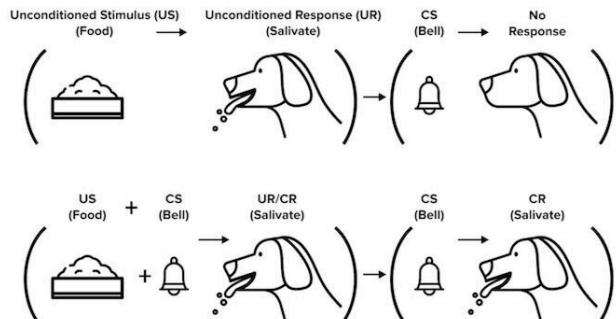
https://www.youtube.com/watch?v=h_-qw-fv3k

<https://www.youtube.com/watch?v=ig-SVifJUKw>

Playlist:

https://www.youtube.com/watch?v=PQyQadCqLAI&list=PL10_shUH1zgVuS40UY1sddtG8TlfTnQKY

- Learning



| | | Reinforcement | Punishment |
|----------|---|---|------------|
| | | Positive | Negative |
| Positive | Add pleasant Ex: Give money | Add unpleasant Ex: Give shock | |
| | Remove unpleasant Ex: Take away loud noise | Remove pleasant Ex: Take away food | |

Videos:

CrashCourse Psychology – Learning:

<https://www.youtube.com/watch?v=128Ts5r9NRE&list=PL8dPuuaLjXtOfse2ncvffelTrqvhrz8H>

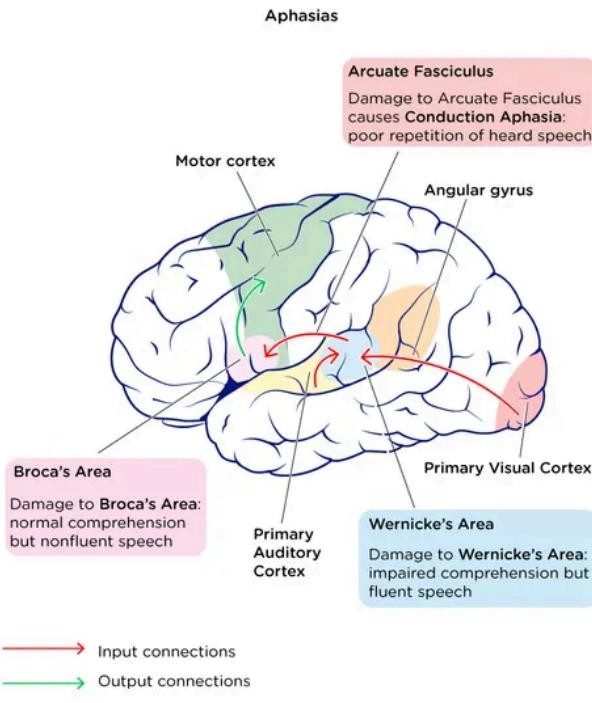
Khan Academy Overview:

<https://www.khanacademy.org/test-prep/mcat/behavior/learning-slug/v/learning>

Khan Academy Practice Questions:

<https://www.khanacademy.org/test-prep/mcat/behavior/learning-slug/e/learning>

- Language



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Videos:

CrashCourse Psychology – Language:

<https://www.youtube.com/watch?v=8SOQduoLgRw&list=PL8dPuuaLjXtOfse2ncvffelTrqvhrz8H>

Khan Academy Overview:

<https://www.khanacademy.org/test-prep/mcat/processing-the-environment/language/v/theories-of-language-development>

Khan Academy Practice Questions:

<https://www.khanacademy.org/test-prep/mcat/processing-the-environment/language/e/language>

- Theories of Sociology

| Major theoretical approaches to sociology | | | |
|---|---|----------------|--|
| Theory | Description | Perspective | Theorists |
| Functionalism | <ul style="list-style-type: none"> Society = an organism Each part of society works to maintain dynamic equilibrium (homeostasis) | Macro | Émile Durkheim, Talcott Parsons |
| Conflict | <ul style="list-style-type: none"> Society = struggle for limited resources Inequality based on social class | Macro | Karl Marx, Max Weber |
| Social constructionism | <ul style="list-style-type: none"> Social actors define what is real Knowledge about world based on interactions | Macro or micro | (Not critical for exam) |
| Symbolic interactionism | <ul style="list-style-type: none"> Meaning & value attached to symbols Individual interactions based on these symbols | Micro | Charles Cooley, George Herbert Mead |
| Rational choice/social exchange | <ul style="list-style-type: none"> Individual behaviors & interactions attempt to maximize personal gain & minimize personal cost | Micro | (Not critical for exam) |
| Feminist | <ul style="list-style-type: none"> Examines gender inequality in society | Macro or micro | (Not critical for exam) |

©UWorld

Videos:

CrashCourse Sociology Playlist:

<https://www.youtube.com/watch?v=3smC4a3sZzA&list=PL8dPuuaLjXtOfse2ncvffelTrqvhrz8H>

Khan Academy Overview:

<https://www.khanacademy.org/test-prep/mcat/society-and-culture/social-structures/v/social-theories-overview>

Khan Academy Practice Questions:

<https://www.khanacademy.org/test-prep/mcat/society-and-culture/social-structures/e/social-structures>

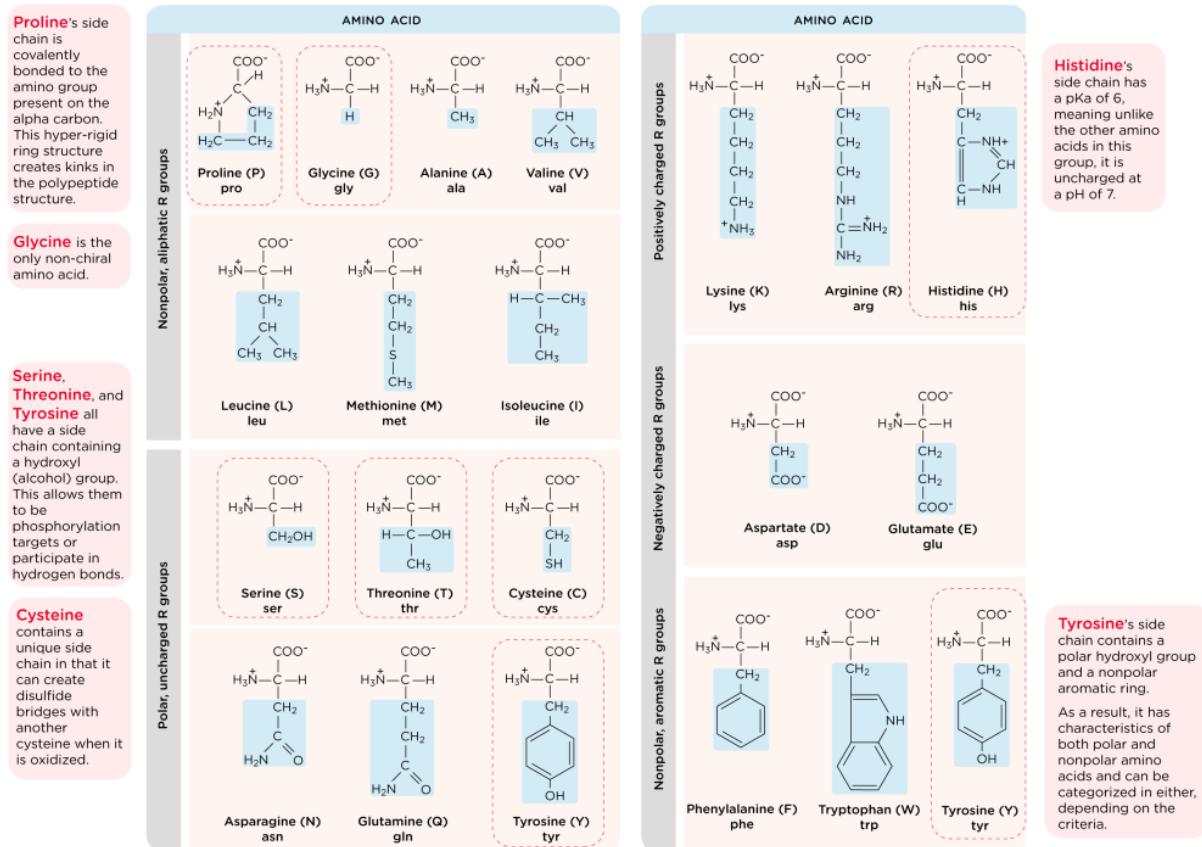
Biochem:

Crash Course Videos:

https://www.youtube.com/watch?v=_I7vMDaeG0M&list=PLTGMFhsK1INRdHidl-tFZ0Otis7BICByD

<https://www.youtube.com/watch?v=RNgojudUgFc&list=PLTGMFhsK1INR2o6Ux8x3sAiiARX-uJpS0>

- Amino Acids



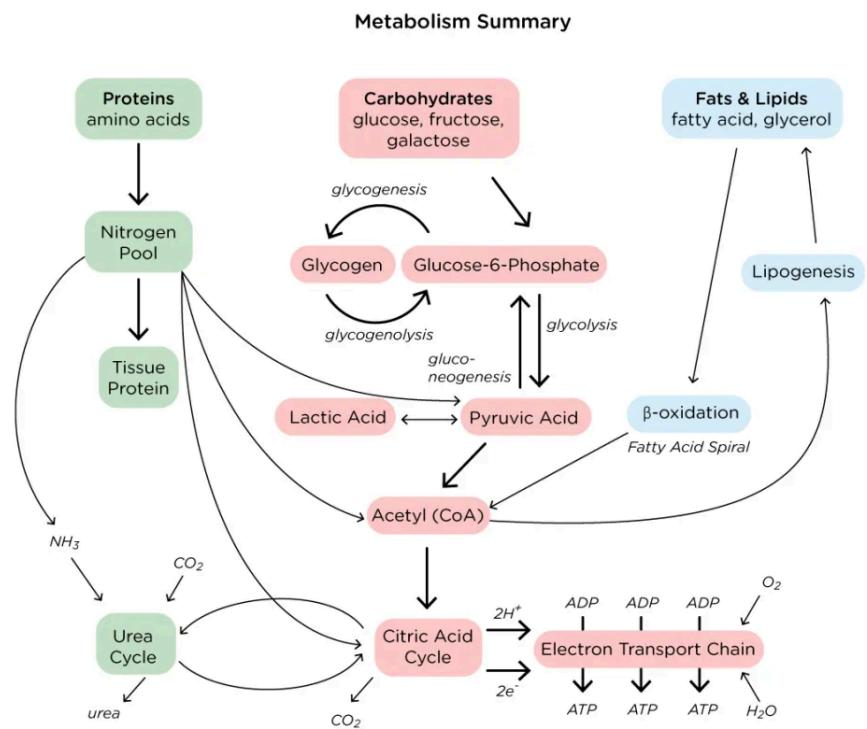
© Jack Westin

Pixorize - Amino Acids Visual Mnemonic:

<https://www.pixorize.com/view/biochemistry/2021/amino-acids>

Leah4Sci - Amino Acid Cheat Sheet: <https://www.youtube.com/watch?v=RTs79YxWpAU>

- Metabolic Pathways



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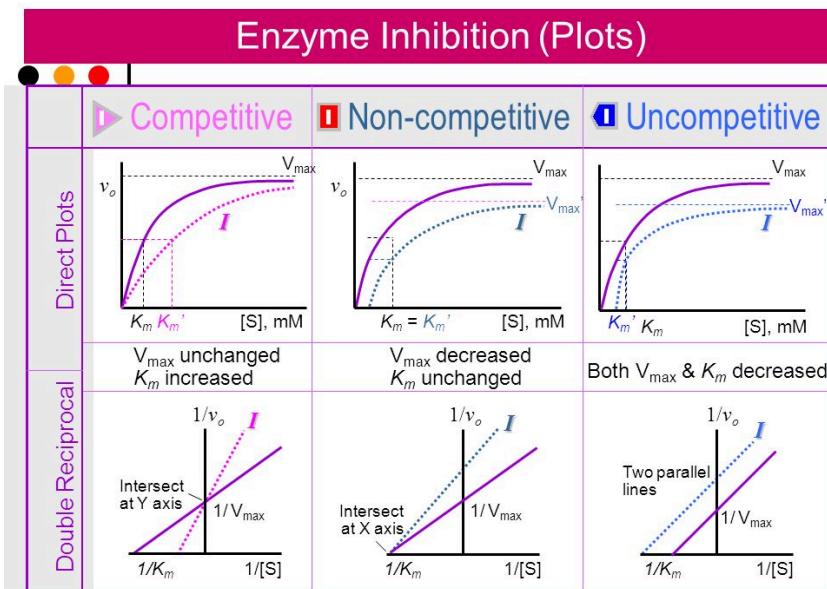
Khan Academy - Glycolysis Overview:

<https://www.khanacademy.org/science/biology/cellular-respiration-and-fermentation/glycoAK>

Lectures - Krebs Cycle: <https://www.youtube.com/watch?v=cDCG81EM01o>

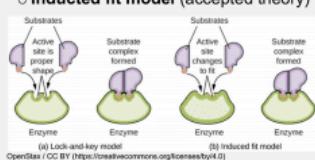
AK Lectures - Electron Transport Chain: <https://www.youtube.com/watch?v=iMLd9bJxWtI>

- Enzyme Kinetics



Enzyme Activity

- Enzyme-substrate binding
 - Lock and key theory (specificity)
 - Induced fit model (accepted theory)



$\downarrow K_m = \uparrow$ affinity

- Enzyme activity *independent* of [S]

 $\uparrow K_m = \downarrow$ affinity (more substrate needed)

- Enzyme activity *highly dependent* on [S]

Enzyme Kinetics

- \uparrow Substrate concentration $[S] = \uparrow$ Reaction rate $[V]$ until reaching V_{max} (saturation).

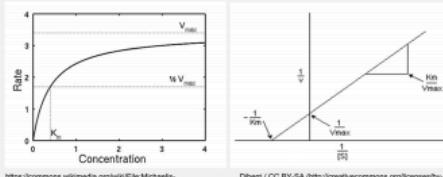
Michaelis-Menten equation

$$v = \frac{V_{max} [S]}{K_m + [S]} \quad \text{At } 1/2 V_{max}, [S] = K_m$$

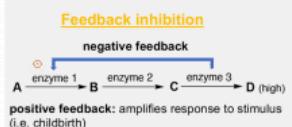
catalytic efficiency = k_{cat}/K_m

Michaelis-Menten

Lineweaver-Burk



Enzyme Regulation



Irreversible inhibition

- Allosteric
- Phosphorylation
- Zymogens

AK Lectures - Enzyme Kinetics Series:

<https://www.youtube.com/playlist?list=PL6C32FE2F76838C29>

Leah4Sci - Enzyme Kinetics: <https://www.youtube.com/watch?v=AC7mNwTgGuw>

Biology:

Crash Course Videos:

https://www.youtube.com/watch?v=rDGqkMHPDqE&list=PL8dPuuaLjXtOAKed_MxxWBNaPno5h3Zs8&index=20

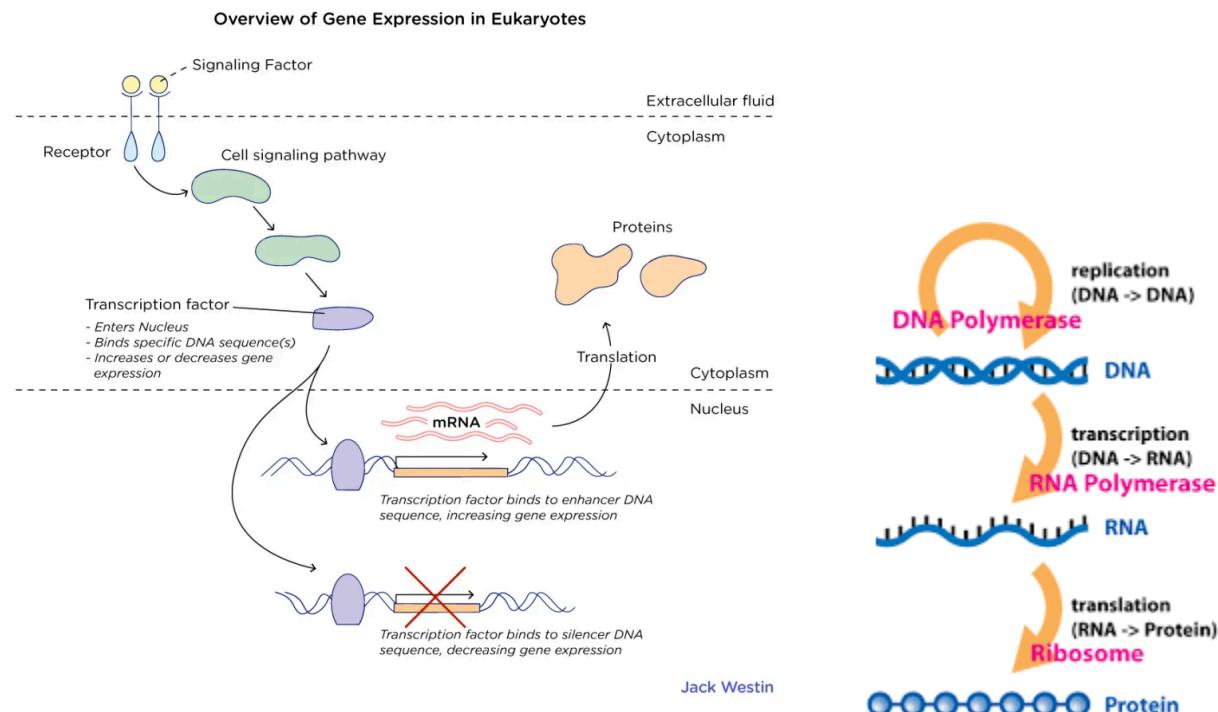
Old

<https://www.youtube.com/watch?v=qMOoMcsGT04&list=PL3EED4C1D684D3ADF>

Kids:

https://www.youtube.com/watch?v=PWGBqskV1UQ&list=PL8dPuuaLjXtPW_ofbxHNCiuLoTRLPMgB

- Central Dogma

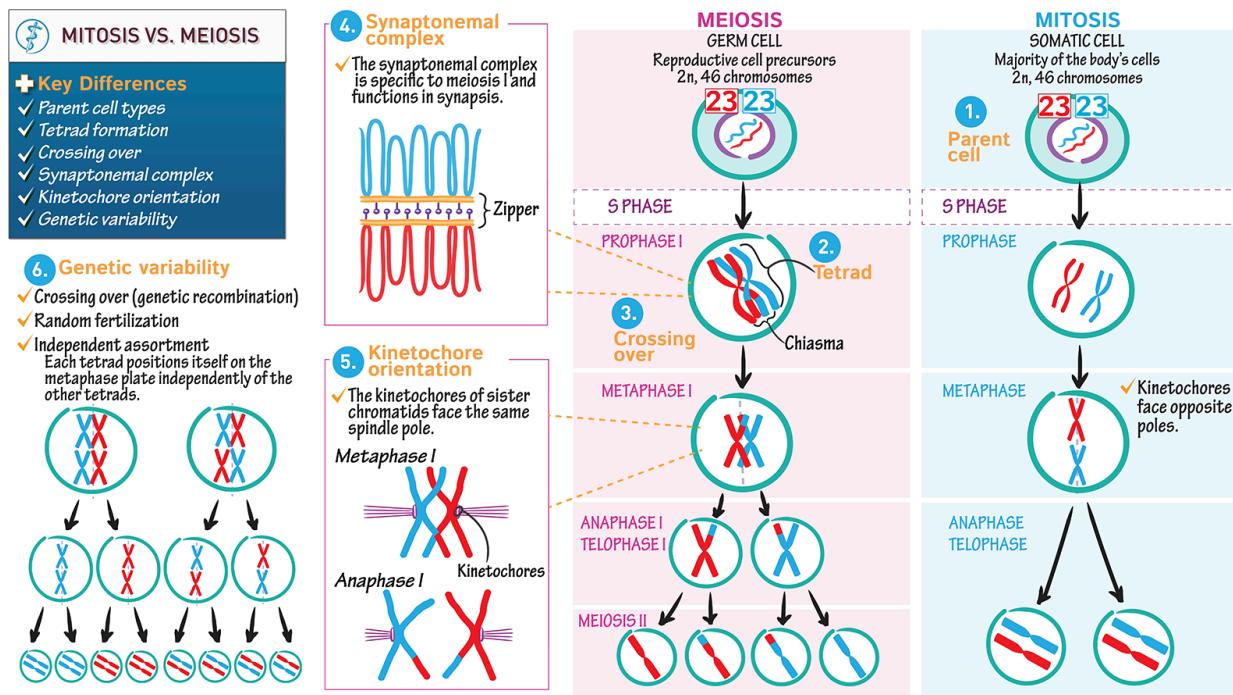


Khan Academy - DNA to RNA to Protein:

<https://www.khanacademy.org/science/biology/gene-expression-central-dogma>

Crash Course - Molecular Biology: <https://www.youtube.com/watch?v=2BwWavExcFI>

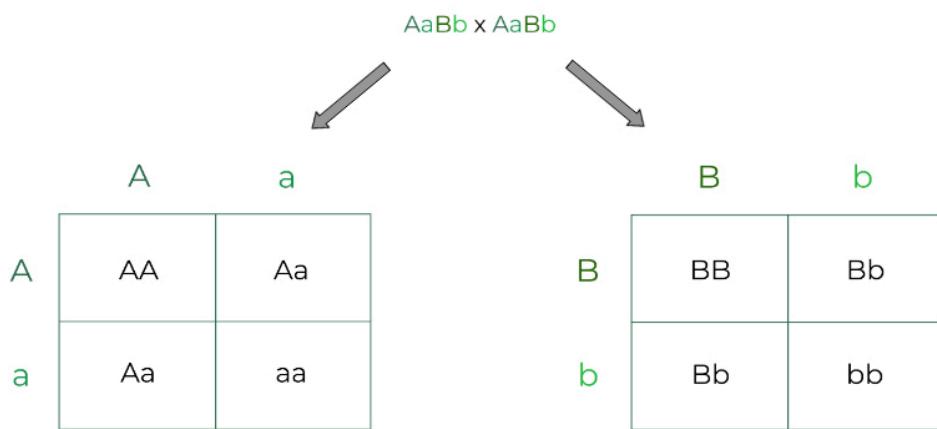
- Mitosis & Meiosis



Crash Course - Mitosis: <https://www.youtube.com/watch?v=L0k-enzoeOM>

Crash Course - Meiosis: <https://www.youtube.com/watch?v=VzDMG7ke69g>

- Properties of Genetics



Bozeman - Mendelian Genetics: <https://www.youtube.com/watch?v=Mehz7tCxjSE>

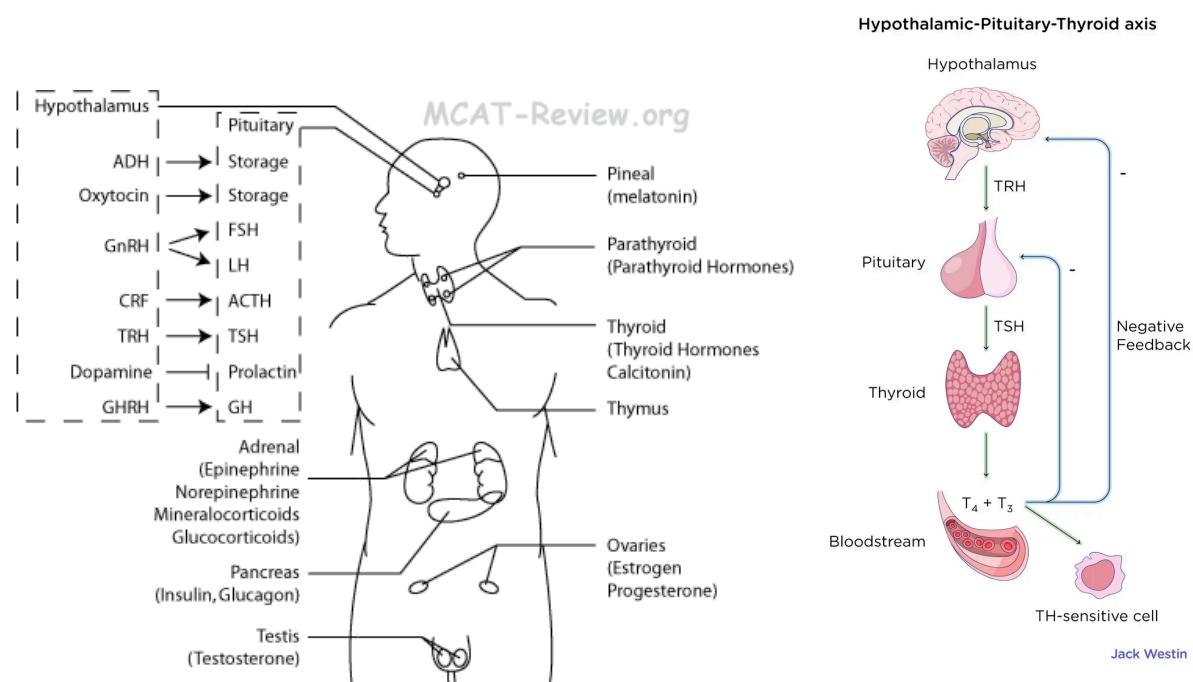
Crash Course - Heredity: <https://www.youtube.com/watch?v=CBezq1fFUEA>

Memonomics:

The classification hierarchy for living things:

King Philip Comes Over For Good Sushi
(Kingdom, Phylum, Class, Order, Family, Genus, Species)

- Hormones / Endocrine System



Khan Academy - Hormonal Regulation:

<https://www.khanacademy.org/test-prep/mcat/organ-systems/endocrine-system/v/hormoCrash>

Course - Endocrine System: <https://www.youtube.com/watch?v=3aQxkF9cGyc>

Memonomics:

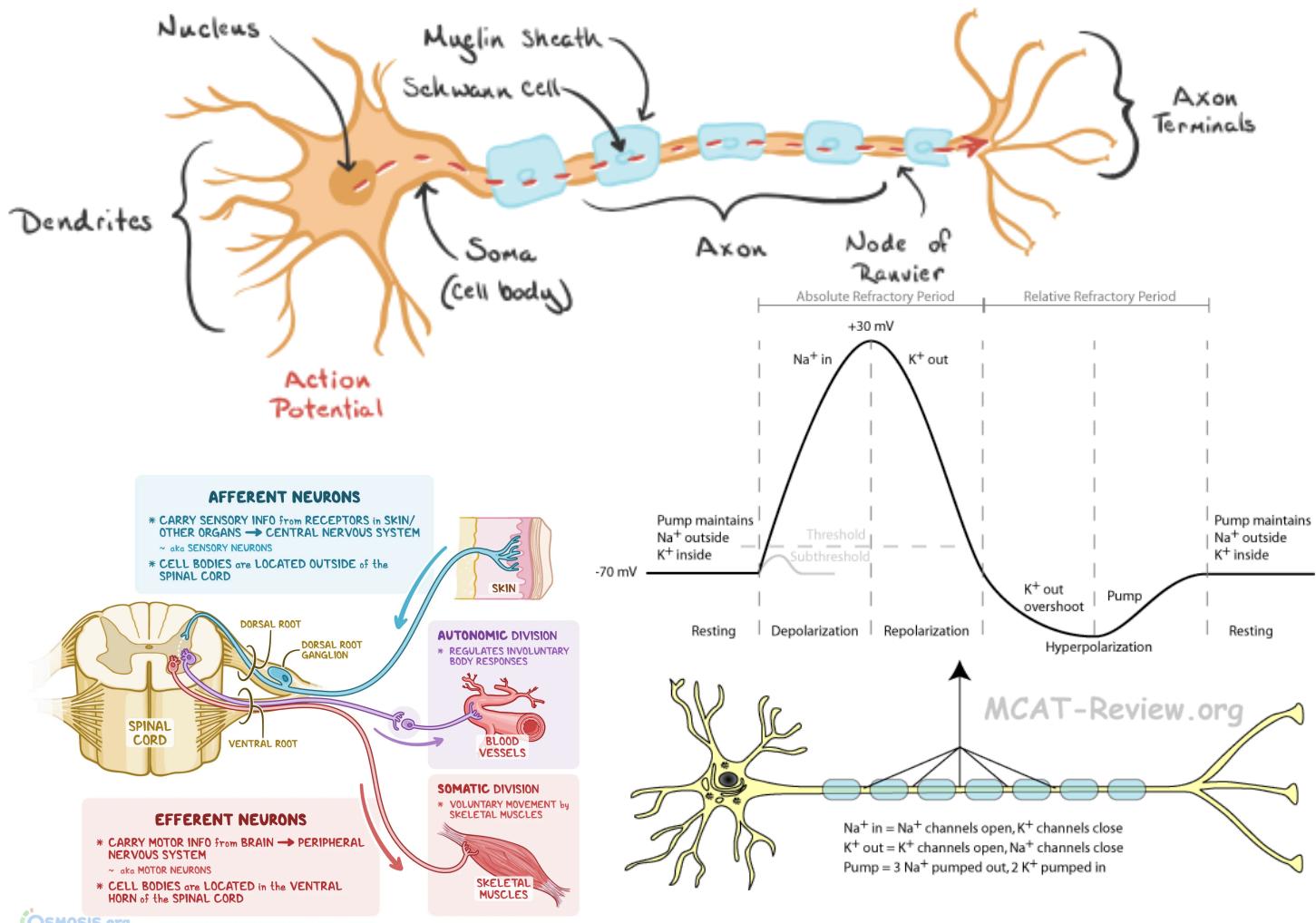
AMPLE GiFTs – is an acronym for the anterior pituitary hormones (ACTH, MSH, prolactin, LH, beta-endorphin, GH, FSH, TSH).

FOL(d)M(a)PS - Ovarian Cycle: Follicular phase, Ovulatory phase, and Luteal phase.

Menstrual Cycle: Menstrual flow, Proliferative phase, and Secretory Phase.

SEVEN UP - Path of Sperm in the Male Reproductive Tract:
 Seminiferous tubules, Epididymis, Vas deferens, Ejaculatory Duct,
 N(Nothing), Urethra and Penis.

- Neurons / Action Potential / Nervous System



Khan Academy - Neurons & Synapses:
<https://www.khanacademy.org/test-prep/mcat/organ-systems/neural-synapses>

Crash Course - Nervous System: https://www.youtube.com/watch?v=qPix_X-9t7E

- Heart

Menomics:

LAB RAt – to remember the bicuspid valve of the left atrium and the tricuspid valve of the right atrium.

To remember the path of the blood:

The door to your house is the SVC/IVC entry to the right atrium.

As you walk through the house, each door will serve as a valve and the room will serve as the next Chamber.

Extra:

Memonic:

Eat Tender Chicken Chunks Elegantly is an acrostic to remember

Proteases in the Duodenum:

Enterokinase, Trypsin, Chymotrypsin, Carboxypeptidase and Elastase.

OChem:

Crash Course Videos:

<https://www.youtube.com/watch?v=bSMx0NS0XfY&list=PL8dPuuaLjXtONguuhLdVmq0HTKS0jksS4>

- Functional Groups

| COMMON FUNCTIONAL GROUPS IN ORGANIC CHEMISTRY | | | | | | |
|---|---|---|--|--|--|---|
| ALKANE | ALKENE | ALKYNE | ALCOHOL | THIOL | THIOETHER | DISULFIDE |
| $R - \text{CH}_3$ | $\begin{array}{c} R' \\ \\ R-\text{C}=\text{C}-\text{R}'' \\ \\ R'' \end{array}$ | $R-\text{C}\equiv\text{C}-\text{R}'$ | $R-\text{OH}$ | $R-\text{SH}$ | $R-\text{S}-\text{R}'$ | $\begin{array}{c} \text{S} \\ \\ \text{R}-\text{S}-\text{S}-\text{R}' \\ \\ \text{S} \end{array}$ |
| (-ane) | (-ene) | (-yne) | (-ol) | (-thiol) | (thioether) | (disulfide) |
| ALKYL HALIDE | ETHER | NITRILE | ALDEHYDE | KETONE | ESTER | ACYL HALIDE |
| $\begin{array}{c} R \\ \\ R'-\text{C}-\text{X} \\ \\ R'' \end{array}$ | $\begin{array}{c} \text{O} \\ \\ R-\text{C}-\text{R}' \end{array}$ | $R-\text{C}\equiv\text{N}:$ | $\begin{array}{c} :\text{O}: \\ \\ R-\text{C}-\text{H} \end{array}$ | $\begin{array}{c} :\text{O}: \\ \\ R-\text{C}-\text{R}' \end{array}$ | $\begin{array}{c} :\text{O}: \\ \\ R-\text{C}-\text{O}-\text{R}' \end{array}$ | $\begin{array}{c} :\text{O}: \\ \\ R-\text{C}-\text{X} \end{array}$ |
| (halo-) | (ether) | (-nitrile) | (-al) | (-one) | (-oate) | (-oyl halide) |
| CARBOXYLIC ACID | AMIDE | ACID ANHYDRIDE | AMINE | IMINE | ISOCYANATE | CYANATE |
| $\begin{array}{c} :\text{O}: \\ \\ R-\text{C}-\text{OH} \\ \\ \text{O} \end{array}$ | $\begin{array}{c} :\text{O}: \\ \\ R-\text{C}-\text{NH}-\text{R}' \end{array}$ | $\begin{array}{c} :\text{O}: \\ \\ R-\text{C}-\text{O}-\text{C}-\text{R}' \end{array}$ | $\begin{array}{c} \text{H} \\ \\ R-\text{N}-\text{H} \\ \\ \text{H} \end{array}$ | $\begin{array}{c} \text{H} \\ \\ R-\text{N}=\text{C}-\text{R}'' \\ \\ \text{R}' \end{array}$ | $\begin{array}{c} \text{N} \\ \\ R-\text{C}-\text{O}-\text{R} \end{array}$ | $\begin{array}{c} \text{O} \\ \\ R-\text{C}\equiv\text{N} \end{array}$ |
| (-oic acid) | (-amide) | (-anhydride) | (-amine) | (-imine) | (isocyanato-) | (cyanato-) |
| AZO COMPOUND | AZIDE | PHENYL | BENZYL | ARYL HALIDE | EPOXIDE | PEROXIDE |
| $\begin{array}{c} \text{R} \\ \\ \text{N}=\text{N}-\text{R}' \end{array}$ | $\begin{array}{c} \text{R} \\ \\ \text{N}=\text{N}^+-\text{R}^{\circ} \\ \\ \text{N}^- \end{array}$ | $\begin{array}{c} \text{R} \\ \\ \text{C}_6\text{H}_5 \end{array}$ | $\begin{array}{c} \text{R} \\ \\ \text{C}_6\text{H}_4-\text{CH}_2 \end{array}$ | $\text{X}-\text{Ar}$ | $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{C}-\text{R}'' \\ \\ \text{R}'-\text{C} \end{array}$ | $\begin{array}{c} \text{O} \\ \\ \text{R}-\text{O}-\text{R}' \end{array}$ |
| (azo-) | (azido-) | (phenyl-) | (benzyl-) | (halobenzene) | (epoxide) | (peroxy-) |

*R Group = An abbreviation used to typically designate a carbon or hydrogen atom substituent
*Ar Group = An abbreviation used to typically designate a functional group derived from an aromatic hydrocarbon

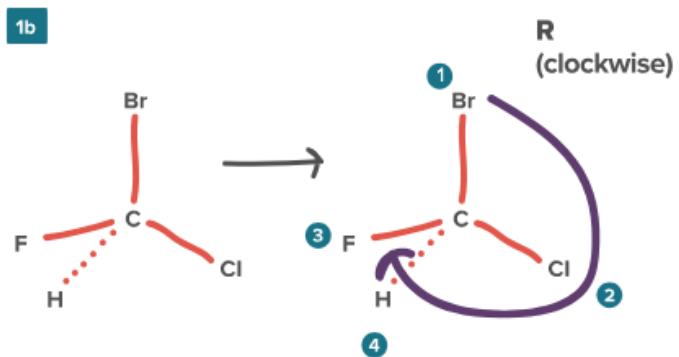
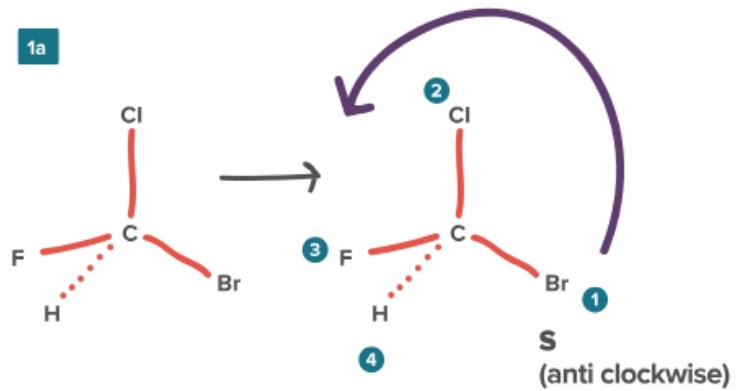
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ChemTalk

Khan Academy - Functional Groups:

<https://www.khanacademy.org/test-prep/mcat/chemical-processes/organic-chemistry/v/func>

- Chirality

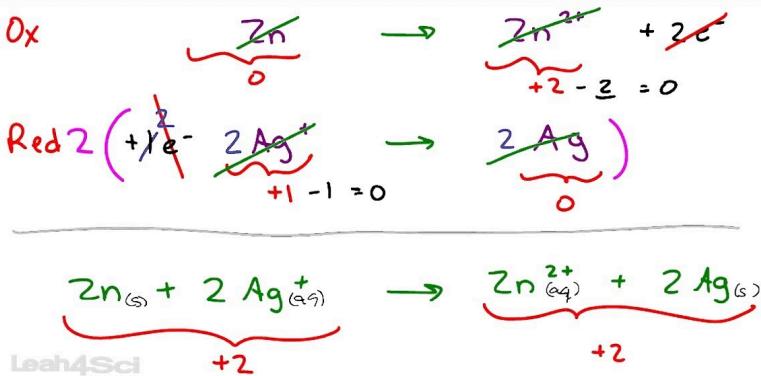


Leah4Sci - Chirality & R/S: <https://www.youtube.com/watch?v=kJ0SEmnB7zY>

- Redox Reactions

REACTIONS & STOICHIOMETRY

BALANCING REDOX EQUATIONS



Khan Academy - Redox Chemistry:

<https://www.khanacademy.org/test-prep/mcat/chemical-processes/redox-reactions/v/redox-reaction>

- SN1 vs SN2

| Aspect | SN2 Reaction | SN1 Reaction |
|--------------------------|--|--|
| Reaction Mechanism | - One-step mechanism with simultaneous bond-breaking and bond-forming. | - Two-step mechanism with formation of a carbocation intermediate. |
| | - Involves a backside attack and inversion of configuration, known as Walden inversion, which flips the stereochemistry of the molecule. | - Involves a planar intermediate and potential for racemization, where both enantiomers can form, leading to a mixture of stereoisomers. |
| Rate-Determining Factors | - Dependent on both substrate and nucleophile | - Dependent only on the substrate |
| | - Second-order kinetics | - First-order kinetics |
| | - Rate = k [nucleophile][substrate] | - Rate = k [substrate] |
| Substrate Structure | - Prefers primary and secondary substrates due to less steric hindrance. | - Prefers tertiary substrates due to the stability of the carbocation. |
| Nucleophile and Solvent | - Strong nucleophiles and polar aprotic solvents are favored. | - Weak nucleophiles can be used, and polar protic solvents are preferred. |

Khan Academy - SN1 vs SN2:

<https://www.khanacademy.org/test-prep/mcat/chemical-processes/nucleophilic-substitution/v/sn1>

Leah4Sci - SN1 vs SN2 Series: <https://www.youtube.com/watch?v=yVR0hNysG3Y>

- Lab Techniques

MCAT Organic Chemistry Lab Techniques

Extraction



Separates two substances based on **solubility**. Two immiscible solvents are used to separate the substance. The more polar substance dissolves into the aqueous layer, while the less polar substance dissolves into the organic layer. Usually, the aqueous layer is more dense, and sinks to the bottom of the funnel, while the organic layer remains on top. Rotary evaporation of the solvent can fully extract the solid solute.

Separates two substances based on boiling point (BP). The initial mixture is heated and the substance with the lower BP evaporates and condenses out into a new container. The substance with the higher BP stays in the original container.

Simple Distillation: used when BP is <150°C and the gap between BPs of the substances is >25°C

Vacuum Distillation: used when BP is >150°C

Fractional Distillation: used when gap between BPs is <25°C



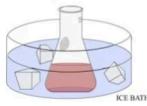
Filtration



Separates a mixture of solid and liquid. The solid remains behind in the filter paper (residue) while the liquid drips through into a container (filtrate).
Gravity Filtration: Takes longer than vacuum filtration.
Vacuum Filtration: Uses a vacuum to suck liquid into the container faster

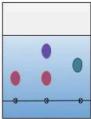
| Method | Use |
|-------------------|--|
| Extraction | Separates dissolved subs. Based on differential solubility in aqueous vs. organic solvents |
| Filtration | separates solids from liquids |
| Recrystallization | Separates solids based on diff. solubilities; temperature is important |
| Sublimation | Separates solids based on their ability to sublime |
| Centrifugation | Separates large things (ex. Cells, organelles, macromolecules) based on mass and density |
| Distillation | Separates liquids based on boiling point (depends on intermolecular forces) |

Recrystallization



The intended product is mixed with a minimal amount of hot solvent so that it can dissolve fully. The product should dissolve very well into the solvent at high temperatures. Letting the mixture cool in an ice bath creates solute crystals.

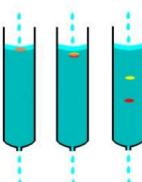
Thin Layer Chromatography



In all chromatography, a stationary phase and a mobile phase exist. If the analyte is more similar to the stationary phase it does not elute as far down the page. If it is more similar to the mobile phase, it moves further down the page. In TLC, the stationary phase is usually polar and the mobile phase is nonpolar. The R_f factor can be used to calculate different components of the original mixture.

$$R_f = \frac{\text{distance travelled by component}}{\text{distance travelled by liquid}}$$

Column Chromatography



In column chromatography, the stationary phase (adsorbent) is usually made of beads and placed in a glass column. The analyte is placed on top of the column, and the mobile phase liquid is passed through. Analyte particles more similar to the liquid elutes first, while particles that are more similar to the beads elutes last.

Ion Exchange: the beads are charged. Opposite charges elute first, like charges elute last.

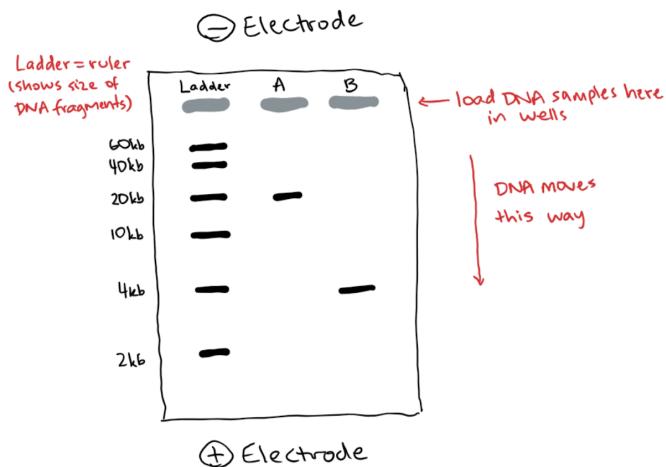
Size Exclusion: beads have small pores that trap smaller particles, allowing large particles to elute first with the mobile phase.

Affinity: beads have receptors that attract certain proteins, allowing others to elute faster

Gas Chromatography



Separates highly volatile vaporizable substances through a gas mobile phase and a liquid stationary phase. The mobile phase is usually inert helium gas or unreactive nitrogen gas. Gases that adhere well to the liquid stationary phase elute last. These readings are usually fed into a computer to perform mass spectrometry.



Khan Academy - MCAT Lab Techniques:

<https://www.khanacademy.org/test-prep/mcat/chemical-processes/separations-purification/leh4Sci>

Lab Techniques Overview: <https://www.youtube.com/watch?v=4tbfnZ7rZhs>

Mnemonics:

SNoW DRoP – Lab techniques and the material they use. Southern blot, DNA; Northern blot, RNA, Western blot, protein