Black_Doc notes :)

AAMC Sample Exam 6/2/20

C/P

Distinguish antagonist vs. agonist vs. placebo vs. catalyst. Identify # of chirality centers, max number of stereoisomers. Know how to write Ksp expression, know what happens when ion product exceeds Ksp. Know amino acid structures. Draw electric field lines across a neuronal membrane. Know how myelin sheath affects conductivity across the axonal membrane, capacitance along the axon, thickness of axonal membrane, what glial cells make up the myelin sheath, how do they differ? Know periodic trends for atomic radius and how to compare the radius of ions in an isoelectronic series. Convert between ms and seconds. Write Ohm's law, how to calculate resistance, relationship between resistivity and conductivity. Convert [H+] to pH

- an antagonist inhibits the natural response of a ligand binding to its receptor, an agonist induces it. A placebo is a substance that has no therapeutic value biochemically, but may have one psychologically. A catalyst increases the rate of a chemical reaction by lowering the activation energy.
- to identify # of chirality centers look for a carbon atom that has four different substituents, the max number of stereoisomers for a molecule with n chiral centers is 2^n, max number of diastereomers is 2^n-2 (two of these are enantiomers, hence the -2).
- Ksp is the ion product at which the solution is saturated (rate of dissolution = rate of precipitation). e.g. for Ca(OH) dissociation, Ksp = [OH-][Ca2+]. When the ion product exceeds the Ksp, a precipitate is formed because no more salt can dissolve in solution.
- i know all the amino acid structures
- resting membrane potential is negative, which means difference across neuronal membrane is negative (inside is more negative than outside, remember the Na-Katpase maintains this), so electric field lines which are drawn from the perspective of a positive test charge are oriented from outside to inside of the membrane
- myelin sheath decreases conductivity across the membrane (increases insulation), but this increases conduction velocity (since charges aren't leaking). The sheath also decreases capacitance because it increases the diameter between the positive side of the membrane and negative side of the membrane, this means less anionic charges are held at the inside of the membrane (Q=CV, since capacitance decreases with distance, the charge the membrane can hold also decreases). Since less anionic charges are on the membrane, less positive charges are attracted to the membrane, meaning the positive charges (wave of depolarization) can spread throughout the axon more easily, facilitating conduction velocity. Myelin sheath increases the thickness of the membrane, but not necessarily the axon diameter, which depends on nerve type (e.g. fast twitch = wider, slow twitch
- schwann cells make up the myelin sheath of PNS neurons, oligodendrocytes for CNS neurons, schwann cells wrap around one neuron, oligodendrocytes secrete a matrix that connects multiple neurons.
- atomic radius decreases as you move to the right of the periodic table due to Zeff increasing, it increases as you move down since additional energy shells are added. In an isoelectronic series, the smallest ion is the one with the greatest number of protons (highest atomic number).
- there are 1000 ms in a second. Ohm's law is V = IR, Resistance = rho (resistivity) * L/A, or conductivity can be substituted for rho (conductivity = 1 / rho). pH is -log[H+]. So a ph of 3 is 1x10^-3 [H+].

Q11W - Does an aqueous solution with a strong acid dissolved necessarily have a low pH, if an acid completely dissolves in aqueous solution is it strong, how can high/low conductivity of a solution with an acid dissolved in it give you info as to whether the acid is strong/weak, what is the rough pH of a 5.0 x 10-8 M aqueous solution of H2SO4? Know how pH affect the solubility of salts (e.g. insoluble bases). Do non-metal/metal oxides form acidic or basic solutions. Squalene is a precursor for what compound, distinguish structure of triacylglycerol, phospholipid, and prostaglandin. Calculate concentration of a specific ion in a dissolved salt. Understand the theory of Tollens' reagent test, what substrates does it test for, how do you identify reducing vs. non-reducing sugars, what functional groups do reducing sugars have in their cyclic/acyclic forms. Understand the mechanism of keto-enol tautomerism, ring-opening/closing. How to determine the net charge of a peptide at a certain pH, what are the pkas of important amino acid side chains (asp, glut, cys, tyr, lys, arg, his, C-term, N-term)

- no, if the strong acid is at a very low concentration, the proton concentration from the self-ionization of water becomes significant, so the [H+] you get is from the self-ionization of water (1x10^-7) plus the strong acid concentration, which will only

give you a slightly below neutral pH. No, don't mix up dissolving with dissociating, if it dissolves that just means it is hydrophilic, that doesn't necessarily mean it donates its proton readily (definition of a strong acid). pH of a 5x10^-8 solution of sulfuric acid is that conc plus the conc of protons in water at neutral pH, together those give you a pH right below 7.
- if you have an insoluble base, imagine the Ksp, adding an acid will shift it right since the acid can donate a proton to hydroxide, favoring the dissolution of more salt.
- non-metal oxides form acidic solutions, metal oxides form basic solutions. To remember this just remember you've never seen like a calcium acidic solution, or a sulfur basic solution.
- squalene is a precursor for cholesterol. Triacylglycerols are a glycerol with three fatty acids, phospholipids are a diacylglycerol with a polar phosphate head group, prostaglandins are unsaturated carboxylic acids with a five-membered ring.
- if they tell you a solution is 0.1 mM $CaCl_2$, then conc of Cl_2 is 0.2 mM (just use the stoichiometry).
- Tollens' reagent using an oxidizing agent (Ag^+) that can be reduced by a reducing sugar. If these are present, a silver precipitate will form. Reducing sugars are those that have anomeric carbons with a free hydroxyl groups. When we think of these, we generally think of acetals with their hemiacetal groups, but this can also include a-hydroxy ketone groups that can undergo keto-enol tautomerism to become aldehydes. Keto-enol tautomerism mechanism is deprotonation of a hydrogen, double bond formation, and protonation of the carbonyl, then the reverse of this process so the carbonyl group forms on the opposite hydroxyl group (to make an aldehyde). Ring-opening is just a protonation of the anomeric carbon followed by deprotonation of the carbon 1 hydroxyl and carbonyl bond formation.
- for net charge of a peptide at a certain pH, see if the n-term and c-term cancel out (they will at physiological pH), then look for residues that might be positively or negatively charged at whatever pH you are considering, figure out what those charges are using the pKR of the side chain, then sum up the net charges. To figure out the pI of a peptide, figure out the number of positive residues (n) then take the average of pkN and pkN+1. pkRs are as follows: aspartate 3.8, glutamate 4.3, cysteine 8.3, tyrosine 10.0, lysine 10.5, arginine 12, histidine 6.00, N-term is 9.5, C-term is 2.0.

Understand the principle behind normal and reverse-phase HPLC and how polarity affects retention time and elution time. Understand definition of Km, interpret Lineweaver-Burke plots (x-intercept, y-intercept, slope) under what condition does Km equal Kd? Identify reducing and oxidizing agents in redox reactions. Differentiate redox, Lewis acid/base, double replacement, and ionization reactions. Understand how a barometer works. How to convert 1 cm^3 to m^3. Q27W - Know the combined doppler equation, explain what each variable is. Know hydrogen halide trends in terms of boiling point, polarity of the bonds, vapor pressure. How does potential energy relate to principal quantum number, know what each of the quantum numbers tells you and their possible values
- normal phase HPLC has a polar stationary phase and nonpolar substances have greater affinity for the mobile phase and thus elute faster with a lower retention time, reverse-phase has a hydrophobic stationary phase so hydrophobic substances have a greater affinity for the stationary face and have a longer elution time and longer retention time.
- Km is substrate conc at which Vo is ½ vmax. Equation is $V_o = V_{max}[S]/K_m+[S]$
- L-B is the reciprocal of the M-M equation: $1/v_o = (K_m/V_{max})(1/[S]) + 1/v_{max}$. X-intercept is -1/km, y-intercept is 1/vmax, slope is Km/Vmax (inversely proportional to catalytic efficiency = kcat/km). Km equals Kd (binding affinity) when the RLS of the enzymatic reaction is enzymatic conversion of substrate to product.
- the reducing agent reduces a molecule and is thus oxidized. The oxidizing agent oxidizes a molecule and is thus reduced as it accepts electrons.
- redox reactions are electron transfers that involve an oxidation and reduction process. Lewis acid/base reactions are those that involve a lewis base donating electrons to a lewis acid. Double replacement is what it sounds like: AB + CD -> AD + BC. ionization reactions occur when a molecule acquires a positive or negative charge by losing or gaining an electron.
- the pressure on the liquid of a barometer pushes up liquid until the hydrostatic pressure of that liquid plus pressure of a gas (if the tube is not evacuated) equal the atmospheric pressure.
- 1 cm^3 = 1 cm * 1 cm * 1 cm = 0.01 m * 0.01 m * 0.01 m = 1x10^-6 m^3.
Combined doppler equation says $F' = (v \pm v_{observer}/v \pm v_{source})f$, where f is the actual frequency of the wave, v is the velocity of the wave, and f' is the perceived frequency of the wave due to a doppler shift. If observer is moving towards the source, understand that frequency will increase, so you use the plus sign in the numerator. If source is moving away from the observer, know that frequency will decrease, so use plus in the denominator.

- HF is the hydrogen halide with highest boiling point due to hydrogen bonding, but as you go from Cl to Br to I the boiling point actually increases b/c there are increased IMFs due to greater delocalization of electrons and thus IMFs
- as quantum number increases, potential energy increases, which is why it is easier to ionize an electron from an outer shell. Principal quantum number tells you the energy (shell) an electron is in (n=1 to infinity). the azimuthal quantum number tells you what subshell they are in, values are l = n-1 to n. Angular momentum quantum number describes the orientation of the subshell, values range from -l to +l. Magnetic spin quantum number describes the spin of the electron, can be -½ or +½.

Q30 - what is the inverse of the dissociation constant known as? Explain how resistivity changes with temperature in conductors and insulators. Know how to determine the amount of energy required to raise the temperature of a certain substance. Q38W - Understand the mechanism of cholesterol synthesis from acetyl-CoA to isopentyl pyrophosphate. Q39W - Understand the mechanism of intramolecular lactone formation, what other organic chemistry mechanism is it similar to? Know IR absorbances for hydrogen bonds and carbonyl groups, where is the absorbance range for C=C bond. What does it mean if an enzyme is enantioselective? Squalene is best known for being a precursor to what? to fix myopia/hyperopia, what type of lens do you need
- inverse of dissociation constant is the association constant also known as the binding constant. For a conductor, as temp increases resistivity increases since there will be more agitation of atoms which can disrupt electron flow. In insulators, as temp increases resistivity decreases since the increased agitation of atoms can lead to more electrons being ionized and thus greater electron flow. Both of these are likely beyond scope of mcat.
- to raise temp of a substance use q = mct.
- mechanism of cholesterol synthesis is complicated, can look in lehninger chapter 21, but the gist is acetyl-Coa + acetyl-Coa via thiolase to acetoacetyl-Coa, HMG-Coa synthase then catalyzes addition of another acetyl-Coa to form HMG-Coa, which is the reduced by NADPH via HMG-CoA reductase to mevalonate. From there, you've got some phosphate group additions then a decarboxylation will get you an activated isoprene (isopentyl pyrophosphate) that can isomerize and come together with other isoprenes to eventually form squalene and then cholesterol.
- intramolecular lactone formation is just like a fischer esterification. A hydroxyl group attacks a carboxylic acid and water is displaced to form an intramolecular ester group.
- IR absorbances for hydrogen bonds are broad in the 3200-3500 range for both N-H and O-H. C=C bond is weaker than a C=O bond so its absorbance is below 1700 in the 1600-1650 wavenumber range.
- if an enzyme is enantioselective then it only reacts with a certain enantiomer of the reactant or it only produces a certain enantiomer of the product.
- squalene is a precursor for cholesterol.
- to fix myopia (nearsightedness), use a diverging (concave) lens to increase the focal length. To fix hyperopia (farsightedness), decrease the focal length using a converging (convex) lens.

Q44 - To isolate polypeptides from a frozen aqueous solution, why is sublimation under reduced pressure more effective than using magnesium sulfate, extraction with an organic solvent, or steam distillation? How should the bp of a contaminant compare to that of water if you are using steam distillation? What is reflux, what is the purpose of it in reactions? Q46 - explain how to relate specific gravity to our weight in air vs. our weight in water (*important to memorize this formula)
https://i.imgur.com/bkIgiBi.png
- to isolate polypeptides, you would use sublimation under reduced pressure because that will likely not denature the peptides since you are keeping the solution cold. Magnesium sulfate wouldn't work because if anhydrous that only works on liquid water and magnesium sulfate is also a salt that could elevate the boiling point of water and make it more difficult to separate from the peptides. Extraction with an organic solvent wouldn't work since water is hydrophilic. Steam distillation wouldn't work because the boiling point of water would likely denature the protein. In steam distillation, you want the boiling point of the contaminant to be much higher than that of water so that you can boil water away from it.
- reflux is used to carry out chemical reactions at higher temperatures so they occur faster and more efficiently, it involves heating a substance at its boiling point then condensing the evaporated substance back into solution (minimizes loss of reactant, maximizing yield).
- formula to memorize is specific gravity = densitysubstance/densitywater = Wair/Wair-Wwater = %submerged

- Relate Ka and Kb to Kw, pH and pOH to 14, and pKa and pKb to 14. Difference between a nucleoside and nucleotide, difference between dAMP and ADP? What amino acids would likely be present in an active site that binds ADP. What does lactate dehydrogenase do and what is its cofactor. Q52W - Explain what an eV is, what are its units in joules, how do you convert it to volts? Know how to determine half-life from a graph, in 99m Tc, what does the "m" mean? What is the charge of a neutrino. Understand the theory behind the use of Doppler ultrasound in cardiology. Know how to figure out work done when given power and a time interval. If an experiment is being performed in a buffered system, what should the pH range of the buffer be? Understand how to use Q=mCT formula to figure out specific heat if given dT in degrees Celsius

- Ka*Kb = Kw, pH + pOH = 14, pKa + pKB = 14. Nucleoside is only the sugar and nitrogenous base, a nucleotide is a nucleoside with one or more phosphate groups. dAMP is deoxyadenosine monophosphate, while ADP is adenosine diphosphate, so the difference is one is deoxyribose and has one phosphate on the 5' carbon, while the other is ribose sugar with two phosphates at the 5' carbon.
- ADP has negative charges so an enzyme that binds it probably has positive residues like histidine, arginine, or lysine there.
- lactate dehydrogenase catalyzes the reduction of pyruvate to lactate by NADH to make more NAD+ for substrate-level phosphorylation. Its cofactor is NADH.
- an electron volt is the amount of energy gained by a charge as it moves through 1 V. 1 eV = 1.6x10^-19 J. to convert it to volts, use U=qV -> eV = qV -> eV/q = V, tells you how many volts a charge moved through to gain a certain amount of energy (in eV).
- m stands for metastable which is a nucleus/atom that has been excited to where it is more stable than the ground state. A neutrino is neutral as the name suggests.
- Dopple ultrasound can measure the frequency shift of a sound wave to figure out the velocity of its target object as long as the velocity of the source is known (it is likely stable).
- power = work/time, so work done is power * time.
- the experiment should be carried out in a buffer that has a pka within 1 of the desired pH range.
- if given dT (doesn't matter K or C, just make sure specific heat units line up), just rearrange the equation to Q/mC = T.

B/B

Be able to distinguish structures of the four main classes of biomolecules. Which of the 6 main groups of enzymes do acyl-CoA synthetase, epimerase, citrate lyase, kinase, phosphatase, and dehydrogenases belong to? Q116W - Explain the difference between anterograde and retrograde transport for protein trafficking. Which domains of life have a Golgi apparatus. Q121W - If an antibody targeting a pathogen is raised in mouse then used to treat humans clinically (passive transfer), what will most likely cause treatment failure? Would normal sons born to hemophiliac mothers, or hemophiliac daughters born to normal fathers, support a role for this trait being X-linked (recessive disease). If you are trying to synthesize functional protein when its mature transcript requires splicing, can you expect to be able to express the full-length gene in bacteria and successfully synthesize functional protein?

- four main biomolecules, lipids, nucleotides, carbohydrates, and proteins, should have structures that are easy to distinguish.
- acyl-Coa Synthetase is a ligase, epimerase is an isomerase, citrate lyase is a lyase, a kinase is a transferase, a phosphatase is a hydrolase, and a dehydrogenase is an oxidoreductase.
- in protein trafficking, we think of the secretory pathway as anterograde transport, so that involves movement from ER->golgi->secretory vesicles->plasma membrane. Retrograde transport is the opposite director, so plasma membrane->endosomes->golgi->ER.
- golgi is a membrane-bound organelle so only eukarya have it, not archaea or bacteria.
- most likely cause of treatment failure is that human anti-mouse antibodies might develop and destroy the mouse antibodies that were passively transferred.
- no, if the trait was X-linked, then all hemophiliac mothers (homozygous recessive) should have sons who have hemophilia, while hemophiliac daughters being born to normal fathers (who give one X chromosome) suggests that there is another chromosome involved.
- no, if you transfect the bacteria with a plasmid harboring the full-length gene, the gene will be translated shortly after being transcribed, no splicing will occur, so you won't have a functional protein b/c it contains the introns.

Do NAD+, FAD, Cytochrome c, ubiquinone, and Fe-S participate in 1 or 2 electron transfers? What two characteristics make a PCR primer most suitable? Q130W - During what stages of cell division does nondisjunction occur? Understand relationship

between glucagon/insulin levels and blood glucose level, protein synthesis, glycogenesis, and glucose uptake. What is transport affinity vs. transport capacity, if a ligand is particularly important to an organism, will its transporter have high or low affinity? Is Km dependent on enzyme concentration?

- NAD+, FAD, and ubiquinone participate in 1 or 2 electron transfers, cytochrome c and Fe-S participate in 1 electron transfers. A PCR primer is ideal if it has a highish GC% with a G and/or C at the ends.
- nondisjunction refers to the actual abnormal separation of chromosomes/chromatids, so it occurs during anaphase 1 or anaphase 2 of meiosis, or anaphase of mitosis.
- increased insulin signals energy abundance and facilitates glucose uptake which decreases blood glucose level, since more glucose is available more can be utilized for protein synthesis and glycogenesis. Vice versa for glucagon.
- transport affinity Kt vs. transport capacity Jmax is a transport protein's equivalent of Km and Vmax for an enzymatic reaction.
- if the ligand is particularly important it will likely have a higher-affinity (lower Kt) so the transporter can more easily bring in the substrate.
- Km is independent of enzyme concentration. When we do M-M kinetics, we assume [S] is much larger than Et, so any changes in Et shouldn't really change the Vo we measure to determine Km.

What effect would swapping L-amino acids to D-amino acids have on the rate of protein synthesis. Compare the energy yield during fermentation and aerobic respiration. Clearly explain the net yield of NADH, ATP, and CO2 during aerobic respiration, why is 36/38 often cited as the number of ATP produced? What is generally happening during the lag phase of bacterial growth. Explain the difference between euchromatin and heterochromatin, which is located at the telomere vs centromere? Which proteins make up the sarcomere's thin filaments and thick filaments. keratin, tubulin, dynein, kinesin, actin, and myosin are characteristic to which cytoskeletal proteins?

- our body uses L-amino acids for synthesis, so swapping in D amino acids will inhibit the process. Aerobic respiration has a 36-38 net ATP yield according to the MCAT, while fermentation has a net yield of 2 ATP.
- for aerobic respiration, glycolysis produces 2 NADH and 2 ATP, the PDH produces 2 NADH and makes 2 CO2 (for both the pyruvates made in glycolysis), and the CAC produces 6 NADH, 2 FADH2, 2 GTP/ATP, and 6 CO2 (for the two acetyl-CoA after the PDH). the MCAT assumes a P/O ratio of 3 ATP are made per NADH, and 2 ATP per FADH2. So together, the 10 NADH produced make 30 ATP, the 2 FADH2 produced make 4 ATP, and add the 4 ATP produced to get 38 total. This 38 becomes 36 if the glycerol 3-phosphate shuttle is used to transfer electrons from the cytosolic NADH made in glycolysis directly to complex 2 of the ETC. if this is done, only 6 protons are pumped across the membrane for this NADH, so only ~2 ATP will be made.
- of note, Lehninger describes P/O ratio for NADH as 2.5, and for FADH2 as 1.5. P/O ratio describes the protons pumped to the intermembrane space as each carrier's electrons move through the ETC divided by the number of protons required to make an ATP (4).
- during lag phase, the bacteria is generally synthesizing substrates it will need to grow.
- euchromatin is being actively transcribed and loosely held to chromatin. Heterochromatin is not being transcribed and is tightly held, it is located at telomeres and centromeres.
- sarcomere thin filaments are made of actin, thick filaments are made of myosin. Keratin is characteristic of intermediate filaments, tubulin of microtubules, dynein (retrograde) and kinesin (anterograde) are microtubule motor proteins, actin with microfilaments, and myosin with microfilaments.

What is the order of the blood vessels? Q38W - what generally leads to the brain detecting a higher intensity signal (e.g. a brighter light). Q37W - Explain why we actually perceive an apple as red, if we were to lose our red cone type, what color would the apple be received? What is the order of the bipolar, ganglion, and photoreceptor cells? Are there eukaryotes that are single-celled, if so give two groups of these organisms. How do eukaryotic vs. prokaryotic organisms reproduce, can the former reproduce asexually? Are tissues capable of extended independent life? What is the purpose of the chloride shift in RBCs? The endosomal pathway is linked with what major degradative pathway during retrograde transport?

- blood vessels go artery, arterioles, capillaries, venules, veins. A higher intensity light source activates more receptors which leads to a greater number of signals being perceived by the brain, which allows us to detect greater intensities.

- we perceive an apple as red because an apple absorbs all colors except red, the red reflects off the apple and activates our red cones which perceive it as red. The absorbance spectra for green and red light somewhat overlap, so if we lost our red cones, green cones would absorb light of red wavelength, so we would perceive objects that are normally red as more green.
- order of activation of these cells is photoreceptors->bipolar cells (think of bi = two = connecting)->ganglion cells
- yes, there are eukaryotes that are single-celled, such as certain type of fungi (e.g. yeast), and protists.
- eukaryotic organisms produce sexually or asexually vs meiosis, mitosis, and in rare instances, binary fission. Prokaryotes only produce through binary fission. Yes, eukaryotic cells can produce asexually (just produce two identical daughter cells) through mitosis or (rarely) binary fission.
- no, tissues are systems whose cells are interdependent, and thus can not live an extended independent life like many unicellular organisms.
- RBCs take up CO2 and convert it to HCO3-, then secrete that HCO3- into the blood, the chloride enters the RBC to neutralize the negative charge that leaves as bicarbonate.
- endosomal pathway is linked with lysosomal pathway

Compare ribonuclease, endonuclease, exonuclease. Explain how the LacI and CAP are transcriptional repressors/activators. How does swapping a hydrophilic for hydrophobic residue at the cytosolic leaflet of an integral membrane protein affect entropic penalty as the protein folds? Which germ layers are the following derived from: bone, adrenal cortex, dermis, lymphatic system, muscle, urogenital organs, connective tissue, cardiovascular system, pancreas, liver, glands, GI tract epithelial, lungs, bladder, epidermis, adrenal medulla, nasal/oral/anal epithelium, pituitary gland, nervous system?
- ribonuclease degrades RNA, endonuclease degrades the inside of a DNA segment, while an exonuclease degrades the ends.
- LacI is a transcriptional repressor, when lactose is present it binds the lac repressor that is bound to the operator, causing it to be released, so RNA polymerase can now facilitate transcription. CAP is a transcriptional activator, when cAMP is present (signals low energy), it binds CAP, allowing CAP to bind the promoter, and facilitate RNA polymerase binding and transcription. Together, both these proteins ensure energy is only used to synthesize proteins required for lactose metabolism when glucose levels are low and lactose is present.
- penalty suggests an endergonic process, which means the change in entropy is negative (becomes more ordered). Swapping a hydrophilic residue for a hydrophobic residue at the cytosolic leaflet which is in contact with an aqueous solution increases the entropic penalty because now an ordered water cage needs to form (lower entropy - higher entropy) = -dS.
- mnemonic: BLGGLP endoderm - bladder, lungs (respiratory epithelia), glands, GI tract epithelial, liver, and pancreas
- mnemonic: BALDMUCC mesoderm - bone, adrenal cortex, lymphatic system, dermis, muscle, urogenital organs (e.g. kidney), connective tissue, cardiovascular system.
- ectoderm - NEPNA adrenal medulla (modified sympathetic ganglion), epidermis, nasal/oral/anal epithelium, pituitary gland, nervous system

P/S

Define spreading activation, the serial position effect vs. recency effect vs. primacy effect, Baddeley's working memory system. Q4 - How long does short-term/working memory last for, does the graph of the serial position effect show that short-term and long-term memory systems are the same or separate processes. Q5 - Do Amnesiacs/Alzheimers' with poor LTM show primacy/recency effects, are they likely to experience proactive interference? Snowball sampling is subject to what type of bias. Define internal vs external locus of control, what category of the DSM are depression, SUD, and personality disorder. Compare social reproduction, institutional discrimination, social stratification, and cultural relativism, confirmation bias. What is an organization vs institution. Define group polarization, anomie, and groupthink
- spreading activation describes how in a semantic network the activation of one node can prime adjacent nodes so that they are more easily activated. Serial position effect describes how we can usually recall early (primacy effect) or late (recency effect) members of a list. Baddeley's working model describes how sensory info enters the short-term memory system where it is manipulated and integrated with other info from the LTM in coordination with two slave systems, a visuospatial sketchpad and phonological loop, as well as an episodic buffer (third slave system). short-term/working memory lasts 15-30 seconds. The graph shows a dip in how well members of the middle of a list can be recalled, suggesting that the primacy and recency effects involve

different memory systems. Amnesiac/Alzheimer's folks often have trouble consolidating new info into LTM, so they are unlikely to demonstrate a primacy effect since they won't have that info there to proactively interfere with later info.
- snowball sampling can lead to sampling bias since recruitment is based on social interaction networks.
- someone with an internal locus of control believes they can control the outcomes of what happens to them, those with an external locus of control believe that exterior forces are responsible for their outcomes. Depression is a mood disorder. SUD is a substance-related and addictive disorder, personality disorders are personality disorders.
- social reproduction is usually used in the context of inequalities to show how they can be transmitted intergenerationally (social, financial, human, cultural capital), institutional discrimination is discrimination by institutional systems rather than individuals, social stratification describes how folks from different social groups receive different resources, experiences, etc. cultural relativism is recognizing that every culture is important, there is no dominant culture that other cultures should be related to (ethnocentrism). Confirmation bias is searching for info to validate one's viewpoint. An organization is a group of people who come together to accomplish a certain task, an institution is a type of organization that primarily tries to influence the way people think or what they believe.
- group polarization describes how a group makes a decision that is more polarized than that of each group member. Anomie describes a situation where a member of a society doesn't feel a connection to it because society doesn't offer them any guidance or help.

Explain the contributions that Spearman, Gardner's, Galton, Binet, Cattell, Thurnstone, Sternberg, Thorndike, Salovey, and Guilford made to the field of intelligence. Understand difference between operant conditioning, classical conditioning, observational learning, what is latent learning. In dizygotic twin adoption studies, how would results differ between twins and their adopted vs. non-adopted siblings if traits were genetically or non-genetically inherited? Compare extrinsic vs. intrinsic motivator, define frustration-aggression hypothesis. What are the age ranges for Kohlberg's stages of moral development
- Spearman used factor analysis to develop his g factor and s factor. Galton was related to Darwin and believed in a biological hereditary for intelligence. Gardner had a theory of multiple intelligences (8 of them). Cattell believed in fluid and crystallized intelligence. Thurnstone was known for his theory of primary mental abilities (7 of them). Sternberg was known for his triarchic theory of intelligence (componential/analytical, experiential, practical). Thorndike was known for his three mutually exclusive intelligence types (abstract, mechanical, and social). Salovey was known for his theory of emotional intelligence. Binet was known for his IQ test and "mental age" concept. Guilford was known for the concepts of divergent and convergent thinking.
- in operant conditioning, a behavior is associated with a stimulus through active learning, classical conditioning is a more passive learning process where two objects are associated with one another, observational learning is learning by watching others, latent learning describes how we can unconsciously learn info and know we've learned it when we have to use it later.
- in dizygotic twin adoption studies, if the separated twins have a trait that is more like each other than their adopted siblings, it suggests the trait has a genetic basis. If the trait is more similar between individuals and their adopted siblings then that suggests the environment is more important than genetics. Intrinsic motivation involves us doing something without reward because it is important to us. Extrinsic motivation is doing something for a reward or to avoid punishment, not for oneself.
Frustration-aggression hypothesis says that frustration can lead to aggression.
- cutoffs for Kohlberg's stages are usually before adolescence for the pre-conventional stages, then adolescence and adulthood for conventional and (if reached) post-conventional stage.

Compare the James-Lange, Cannon-Bard, Schacter-Singer two-factor, and Lazarus cognitive-meditational theory. Assimilation vs. discrimination vs. socialization vs. stratification. Piaget's stages of development age ranges, when do object permanence, assimilation, accommodation, conservation, hypothetical reasoning occur? Explain world systems theory
- James-Lange says the physiological response dictates the emotional response (affect), ex if you are sweating then you are scared. Cannon-Bard says the physiological and cognitive aspects of emotion are independent of one another. Two-factor theory says that we search our environment for clues as to why our physiological response occurs to label the emotion.
Cognitive-mediational theory says a stimulus evokes an emotional reaction whose response depends on how we appraise the stimulus (e.g. appraise as exciting vs. fearful).
- assimilation is making something familiar to oneself (e.g. cultural assimilation), discrimination is the actual treatment of folks from certain groups in unjust ways, socialization is learning the norms, attitudes, beliefs, etc. of society, stratification describes the hierarchical organization of certain social groups.

- Piaget's sensorimotor stage is 0-2, preoperational stage is 2-7, concrete operational is 7-11, and formal operational is >12. Object permanence occurs by end of sensorimotor stage, assimilation/accommodation of info into schemes occurs at all stages, conservation occurs during concrete operational stage, hypothetical reasoning occurs during the formal operational stage.
- world systems theory essentially says that there are periphery countries who have poor infrastructures that cause them to rely on more powerful core countries with stronger infrastructures that can import raw goods from the periphery countries and use them to manufacture products they can export for more money. Semi-periphery countries link core and periphery countries, sharing characteristics of both.

Compare the "me" and "I" in terms of which one is more autonomous. Compare stimulus discrimination vs. generalization, spontaneous recovery, second-order conditioning, extinction. Oxytocin vs. melatonin vs. leptin vs. cortisol. Compare variable/fixed interval/ratio in terms of whether they have moderate/high response rates that are steady/paused, which partial reinforcement schedule is most resistant/susceptible to extinction?
- the "I" is more autonomous, the "me" is socially conditioned. Stimulus discrimination is being able to decipher between two stimuli, generalization is when multiple stimuli produce the same response.
- second-order conditioning is one a neutral stimulus is associated with an unconditioned stimulus to produce a conditioned stimulus (C1), which is then associated with another conditioned stimulus (C2). thus, if successful, when C2 is presented alone it produces the initial unconditional response of the unconditioned stimulus. Extinction is when a learned behavior decreases in frequency, this naturally occurs in conditioning.
- oxytocin regulates uterine contractions and feelings of attachment, melatonin regulates the sleep-wake cycle and circadian rhythm, leptin regulates satiety, cortisol regulates the stress response.
- variable ratio (e.g. gambling) has the highest response rate that is steady, a variable interval has a high response rate with pauses after each reinforcement, fixed ratios have moderate response rates that are steady, variable intervals have moderate response rates with intervals after each reinforcement. The variable ratio is the partial reinforcement schedule that is most resistant to extinction, while the fixed interval is the most susceptible to extinction.

Explain stereotype threat, bystander effect. Compare law of similarity, proximity, continuity, and common fate. Compare master status, achieved status, ascribed status, and social status. Can someone with split brain articulate what is presented to their left visual field. Is it better to view a dim object in the periphery or center of your field of vision
- stereotype threat describe how the pressure of a negative stereotype can lead to a sort of self-fulfilling prophecy where that pressure can decrease performance and lead to the stereotype being fulfilled. Bystander effect describes how people are less likely to help someone if they are in a large group due to a diffusion of responsibility.
- law of similarity says visual elements are grouped in unified wholes if they look similar, proximity groups objects close to each other, continuity groups objects that are continuous in lines, common fate groups objects that appear to move in the same speed/direction (e.g. flock of birds).
- master status is the dominant status someone is known as, achieved status is what someone has accomplished, ascribed status is what someone is born into, social status is where someone is perceived in their societal hierarchy.
- no, someone with split brain can't articulate what is presented in their left hemisphere because visual info from the left field is perceived in the right side of the brain but that info can't be transmitted to the language processing centers in the left side of the brain.
- rods, which are more sensitive, are predominantly located in the periphery, so it is better to view a dim object in our periphery.

Compare social mobility, ethnocentrism. Social capital vs cultural capital, charismatic authority. Compare regression vs. reaction formation vs. projection vs. sublimation. What is social constructionism, linguistic determinism
- social mobility describes whether someone can move horizontally or laterally in social standing. Ethnocentrism is the belief that one's culture is dominant and superior to all others and that other cultures should be judged relatively to the dominant culture.
- social capital describes one's social relationships, cultural capital describes someone's attitudes, beliefs, views, etc., usually both are used in the context of inequalities and social reproduction theory. Charismatic authority is authority given to someone based on their charisma.
- regression is when someone retreats to an earlier stage of development to protect themselves from the anxiety that can result from dissonance between the id and ego, projection is when these undesirable feelings are blamed on someone else (e.g. blame

shifting), reaction formation is when someone has a completely opposite reaction to their feelings (e.g. you have a crush on someone you shouldn't, so you act like you hate them), sublimation is when people use their undesirable feelings in positive way (e.g. feeling aggressive, so you channel that into increased motivation for work).
- social constructionism is a theory that describes how social constructs are built from social interactions that are unique to the cultural context, social constructs survive if they are continuously reinforced, while those that aren't reinforced will disappear over time.
- linguistic determinism describes how language influences thought (weak Sapor-Whorfian hypothesis), or how language controls thought (strong Sapor-Whorfian hypothesis).

AAMC FL 1 6/4/20

C/P

Understand general theory behind chromatographic separation, a higher rF correlates to what affinity with the stationary/mobile phase, are dehydration reactions usually stereospecific.
Explain the dependent of substitution reactions on the substrate's degree of substitution (e.g. SN2 reaction rate for primary vs. secondary alcohol).
What dictates retention time in GC-MS? What is the structure of an imide, what two substrates combine to form an acid anhydride, in the Fischer esterification, which hydroxyl should be radioactively labeled to figure out which reactant loses the hydroxyl group?
What is the unit for a diopter, how to interconvert between focal length (cm) and diopters, if a person has an eye whose lens-radius distance is 2 cm, and they are clearly able to see objects 1 meter away, what is the power of their lens?
What is the mechanism by which enzymes work?
How does chlorination of acetic acid affect its acidity, how does dilution of acetic acid affect the concentration of acid in the resultant solution, concentration of hydrogen ions in the resultant solution, pH of the resultant solution, and % of acid that has ionized? How would adding a base indicator affect the equilibrium in this reaction?
What formula to relate speed of light in a vacuum to refractive index and its velocity in a medium?
What is the formula for intensity of radiant energy, energy of a photon formula?
How to calculate MAP from systolic and diastolic pressure, what is pulse pressure, is diastole or systole longer?
How many mmHg in an atm? if a substance has a 1/2 life of 2 mins, what fraction of it decays in 12 mins?
How much energy is produced over a 10 minute period and a power source of 200 W?
Which direction is an a-helix, in which direction do R groups orient themselves in a-helices vs. b sheets?
Use continuity equation to explain difference between capillary and artery blood velocity .
What is the orbital hybridization for see-saw or square pyramidal molecular geometries? What is the difference between sp3d2 and d2sp3 hybridization, what is the steric number?
What does the kinetic molecular theory say about the IMFs between molecules in an ideal gas or the volumes of the individual gases, what is the temperature in STP? What is a gram-mole?
What is an opsin, what is the purpose of having opsin that absorb light at different frequencies, what isomerization occurs when a photon strikes retinal?
What is the name of the enzyme that catalyzes ATP hydrolysis?
What is the net change in charge for a peptide with R33G, K112D, M134D, Y193C, and I157M mutations?
Briefly explain the mechanism of glycogen synthase, precisely describe the glycosidic bonds formed in glycogen (amylopectin, amylose)
How many carbons does fructose have, is it a pyranose or furanose, ketone or aldose, answer these questions for the normal structure of ribose, draw Fischers of glucose, fructose, and ribose.
How does net charge affect acidity (e.g. phosphorous acid series).
What is the magnification and orientation (inverse or upright) of an object located 3 focal lengths from a convex lens?
If a reaction is exergonic and carried out at RT, what does dS have to be (negative or positive) to characterize the spontaneity of the run?
What is a heterogeneous vs homogenous catalyst?
How does increasing temp generally affect the current in a wire?

If an aluminum strip is placed in a solution of aqueous Zn2+ and a new solid forms, and a Zinc strip reduces HCl to H2(g), would you expect Al(s) to also produce H(g) when reacted with HCl.
When you have two half-rxns with different reduction potentials, how do you figure out which one will have the substance that is the reducing agent, how do you figure out the electrode potential of the reaction?
Briefly explain the common ion effect.
How do you figure out the volume of solution of a certain molarity that contains a certain amount of moles?
What are the units of power in terms of N, m, and s?

B/B
What is a dominant negative mutation, if a pro-tumorigenic protein is only located In cancer tissue is it the result of somatic or germ line mutations. If deletions in intron 8 cause exon 9 to be excluded from the mature transcript, what element was likely lost from intron 8 as a result of the deletion, where are splice donor and acceptor sites located? What class of protein helps with protein folding?
What is the endo-membrane system? What happens when a protein with a signal peptide is translated?
Briefly explain what happens during excitation-contraction coupling, what is the purpose of the sodium-potassium atlases in neurons, in which direction does it move sodium and potassium ions?
How many rings are present in the steroid nucleus?
How would increasing the threshold for an action potential affect the frequency of abnormal neuron firing?
What is the usual conc of filtrate as it moves through the different portions of the nephron, when is it most/least concentration, explain why.
Compare enzyme activity vs. specific activity.
What is an ABC transporter, what regions of cell membranes are particularly rich in cholesterol?
What exactly is a cell plate? What three pressures drive glomerular filtration?
Can enzymes alter substrate primary structure, local pH, substrate shape, or co-localize substrates?
How does the difference threshold correlate with sensitivity? What is specificity vs sensitivity?
Do erythrocytes have DNA?
Which pathogen is an obligate parasite?
Do bacteria contain telomeres?
Inhibiting RAAS activity causes what changes in serum sodium and potassium levels?
If a patient has cortisol deficiency, how would levels of CRH and ACTH compare to someone who doesn't?
How does cortisol affect protein metabolism, would those with a deficiency in cortisol be expected to have muscle hypertrophy or atrophy?
Are muscle cells solely reliant on insulin-dependent glucose uptake? Are loss of appetite or unexplained weight loss characteristic of diabetes?
Understand the semi-conservative model of DNA replication.

P/S
Compare the stability of triad vs. dyad
What is categorical perception, compare state vs. context-dependency effects, what is the misinformation effect, what concept is it sort of similar to. What is the dual-coding effect? according to Piaget's theory, at what age range is conservation learned? Conditioning belongs to which of the main psychological schools? Give an example of classical conditioning. explain the relationship between the sclera, conjunctiva, and cornea. What type of receptors are hair cells? Distinguish actor-observer bias, fundamental attribution error, and self-serving bias. Give an example of habituation followed by dishabituation.
If there was a negative stereotype associated with an ethnicity that is important to one's self-concept, how would their propensity for stereotype threat compare to someone who does not associate their identity with their ethnicity as much?
Is research allowed on people with psychological disorders?
Does the general adaptation syndrome model believe there are only certain (e.g. physical) types of stressors
Main function of cerebellum
Compare group polarization and conformity
How do too high/low outliers affect the relationship between the median and mean of a dataset

What is gentrification. What does it mean if a measurement tool is valid?
Remind me of the stages of Erickson's theory.
Compare the linguistic relativity theory with the nativist hypothesis
What is the capacity of working memory
What is extrinsic vs intrinsic motivation
What is content analysis
Episodic, explicit, procedural, semantic, and priming involve which LTM systems
What is role strain vs. role conflict
In general, according to AAMC, how does group stability/intimacy change as group size increases, are triads or dyads more stable.
What is a mixed-methods study.
What is comparative methods research vs. ethnographic research?
What type of status predominates in a caste system, is their social mobility/stability?
Define: spreading activation, interoceptive awareness, optimal arousal theory, reference group

AAMC Chem QP

In a vacuum fractionating distillation, how does decreasing the boiling point (e.g. raising the atmospheric pressure) or lengthening the column affect resolution? For the reaction A->Bn + nC, how can you write [B] in terms of [C]. What is the mnemonic for electronegativity? Are Ca and I, or C and F, more likely to form ionic bonds? How to figure out # of possible unique peptides for x amount of unique amino acids? Are covalent/ionic compounds usually made of metals or non-metals? Cutoff for Pauling scale? How does the melting point of covalent vs. ionic compounds compare ? Is a solution of aqueous NaNO2 acidic, basic, or neutral? When glycerol reacts with three different fatty acids, how many stereogenic centers does the product have? Are fatty acid salts soluble in nonpolar and/or polar media? What is the empirical formula, when figuring it out can you go from C3H3R6 to C2H3R4? Does a catalyst technically induce more collisions between reactant molecules? What's a conj base vs. conj acid?

- lengthening the column always increases resolution during separations, decreasing the boiling point makes it more likely for compounds to transition from the liquid to gas phase so it may decrease resolution.
- the stoichiometry of the rxn says that for every 1 mole of Bn there are n moles of C, so you can relate this as [B] = 1/n[C]
- mnemonic for electronegativity is FONClBrISCH.
- Ca and I are more likely to form ionic bonds which tend to form between metal and nonmetal compounds, although F is the most electronegative atom, F and C are both nonmetals. Note that the actual electronegativity difference between these pairs of atoms is approximately the same based on the Pauling scale.
- # of unique peptides is n! where n is the number of residues.
- covalent compounds are usually between metals, ionic compounds are usually a metal and nonmetal
- cutoff for Pauling scale is as follows: ionic > 1.7, polar-covalent 0.5-1.7, nonpolar covalent <0.5
- due to the strong electrostatic interactions, ionic compounds have stronger IMFs that increase their melting points relative to covalent compounds that don't have these attractive forces and thus have lower melting points.
- note that NO2- is the conjugate base of nitrOUS acid, a weak acid, thus, NO2- can be hydrolyzed by water to form HNO3 and hydroxide ions which make the solution slightly basic. The other ion in this salt hydrolysis, does not react with water because it is the conj acid of a very strong base (NaOH).
- it forms one stereogenic center at the middle carbon of the glycerol.
- fatty acids are partially soluble in both due to their polar, charged heads and nonpolar tails
- empirical formula is the lowest representation of a molecular formula that contains integers. Yes, you can multiple by ⅔ to get the empirical formula C3H3R6.
- no, increasing temp increases collisions, the catalyst itself lowers energy which just makes it more likely for the collisions to have enough energy to overcome the activation energy.
- conj base is when an acid donates a proton, conj acid results when a base accepts a proton

Physics QP

How to relate frequency between harmonics? Why are doppler shifts for EMR less discernable than those of sound? If an obj is 90% submerged in a fluid on earth, how submerged is it on the moon? Relate formulas for work, voltage, electric potential energy, and electric field to one another using the terms for Coulomb's law. If you are told that two wavelengths correspond to an n and n+2 harmonic for an open-tube, how do you figure out the length of the string for that tube? If an object emitting a sound is thrown into the air, how does the frequency shift of its sound wave change as it ascends then descends? Do capacitors store energy? What happens to current as an RC circuit charges and discharges? What is the formula for the PE stored in a capacitor? Are the waves that make up a standing wave going in the same/opposite direction, how does their magnitude compare?

- frequency between a harmonic series are related by fn = fundamental frequency * n, where n is the nth harmonic. EMR moves so fast that the speed of the source/observer won't influence the perceived frequency. It will be submerged the same amount on the moon since the decreased g in both the buoyant force and weight cancel each other out.
- Coulomb's law: F=kQq/r^2, E = F/q = kq/r^2, V = kq/r, U = kqQ/r
- if told two harmonics have two wavelengths (e.g. 8 and 4.8), then remember the equations nlambda/4 = L to relate wavelength of a harmonic to the length of the strength, rearrange this to isolate 4L=nlambda, then plug in the wavelengths for the nth harmonics of an open-tube: 4L=n(8) and 4L=(n+2)(4.8), equat ethos two equations and solve for n: 8n = (n+2)(4.8) -> n = 3, which means n corresponds to the 3rd harmonic for a wavelength 8 m longs, and n is the fifth harmonic for a wavelength 4.8 m long. From this info, you can use either to figure out the length of the string as 6 m.
- as the object moves away during its ascent the perceived frequency decreases, then as it stops moving and falls back to us the perceived frequency increases.
- capacitors store charges on their plates that have PE = 1/2CV^2.
- the waves that make up a standing wave are going in opposite directions with equal magnitude, if they didn't have equal magnitude it would be an asymmetrical waveform.

Bio 1 QP

Which way is sodium reabsorption in the loop of Henle, what pump facilitates this? Why are host antibodies ineffective against H. Pylori, Decreased heart beats results in a shift to aerobic/anaerobic metabolism? Is conjugation best known for occurring in gram-positive vs. gram-negative bacteria? Are protozoans eukaryotes or prokaryotes? What is amitotic division? Difference between ovum and polar bodies in terms of nuclear/cytoplasm content? Is there apportionment in amitotic or mitotic division? What exactly is ploidy, what is a 45-ploid cell? Increased myoglobin in the urine is most likely a result of damage to what two tissues? In a cold environment, what is the most likely reason for the occasional dilation of skin blood vessels?

- sodium potassium atpase on loop of henle cells is on the basolateral side with sodium being transported against its concentration gradient into the interstitial space. H. pylori inhabits the acidic stomach which denatures most proteins like antibodies. Decreased heart beat would result in a shift to anaerobic metabolism since there is less delivery of O2. conjugation is best known for occurring in gram-negative bacteria, i believe it also occurs in gram-positive bacteria, but the mechanism isn't as well known. Protozoans are single-celled eukaryotes, an example are the ciliates. Amitotic division is a type of asexual reproduction that results in an uneven nuclear division. Ploidy is the number of chromosome copies an organism has, if it is 45-ploid it has 45 copies of each chromosome. Increased myoglobin would suggest muscle damage and kidney damage. Occasional dilation of skill blood vessels ensures that the most anterior skin cells are still getting adequate oxygen.

How do meiosis 1 and mitosis compare in terms of the pairing of homologous chromosomes and the splitting of centromeres? Would less ATP most likely affect male fertility via. Testosterone conc or sperm motility? Would liver dysfunction be more likely to affect fat digestion or blood pressure regulation? If a cyclin is needed for progression to a certain phase of the cell cycle, when will its concentration be highest? Does vitamin c promote bone resorption or formation? Complex question, but why does hypocalcemia lead to increased neuronal excitability.

- meiosis 1 has a pairing and separation of homologous chromosomes, while mitosis lacks a pairing of homologous chromosomes and instead has the splitting of centromeres so each daughter cell gets a chromatid. ATP is required for cell motility so it is more likely to affect fertility by aspecting sperm motility. ATP is required for steroid synthesis, but that's not the most likely way in which fertility will be directly affected. Liver dysfunction would be more likely to affect fat digestion since bile is synthesized in the liver, although the liver synthesizes plasma proteins like albumin which affect colloid osmotic pressure, this isn't the best

direct link to blood pressure regulation. The cyclin is likely synthesized before it is needed, so if it is used during mitosis it is likely synthesized at the end of interphase.
- vitamin c promotes bone formation. Hypocalcemia, decreased calcium conc in extracellular space, makes the membrane potential across the neuron less negative because the extracellular space has less positive charges, thus increasing the membrane resting potential, which sensitizes neurons to firing.

Does producing more offspring or being less subject to predation make a species more likely to evolve? In accordance to the endosymbiotic theory, what can explain how initially anaerobic eukaryotic genomes acquired nuclear DNA that can express genes required for aerobic respiration? How does an impermeable integument affect an organism's ability to thermoregulate in hot temps? By which mechanisms of heat transfer does vasodilation facilitate cooling? E. Coli gram positive or grams negative?
- although being less subject to predation increases the fitness of an organism, what actually matters is that this increased fitness results in more offspring, which eventually skews to allele distribution to where a new species is formed. There could easily have been genetic transfer between the aerobic prokaryote genome (mitochondrial DNA) and nuclear genome of the anaerobic eukaryotic host, which has now resulted in the eukaryotic genome having the essential genes, which is likely beneficial because it ensures every daughter cell has the genes required for aerobic respiration. An impermeable integument prevents an organism from being able to sweat and thus dissipate heat, increasing their body temp. Vasodilation facilitates cooling through convection, conduction, and radiation (movement of heat from low to high areas). E. coli are gram negative.

Where in long bone is cartilage found, how does the amount of cartilage in long bone for adults vs. children compare, what process contributes to this (skeletal maturity)? What are sweat ducts? Is the epidermis permeable?
- long bone has cartilage at the ends of the epiphysis and at the epiphyseal plate, which is between the diaphysis and epiphysis, when bone is still growing in children. As children grow, endochondral ossification occurs, which converts the cartilage at the epiphyseal plate into bone. Sweat ducts allow sweat produced in the sweat glands to be secreted out of the body. The epidermis is selectively permeable

Bio QP 2

If someone has a bacteria infection and after a course of abx treatment still has some bacteria left, what is the likely source if these cells, are the antibiotic inducing the formation of mutations? Can conjugation occur between different bacteria species? Is it normal for E. Coli to be in the colon or appendix, why does a ruptured appendix require abx to treat? According to endosymbiotic theory, what formed the outer membrane of mitochondria? Do the lysosome, mitochondria, nucleus, ER, and Golgi have one or two membranes?
- the bacteria cells that persist likely had mutations that already made them resistant to the abx, abx treatment just selects for those mutants, it doesn't actually cause the mutations. Yes, conjugation can occur between different species. Yes, e. Coli is in the colon which is continuous with the appendix, a ruptured appendix can cause bacteria to infect the peritoneum which may lead to sepsis so you need to treat it quickly with an appendix. According to the endosymbiotic theory, the mitochondria were derived from a prokaryote, whose outer cell membrane resulted from endocytosis of the host cell membrane and the inner mitochondrial membrane is the prokaryote's plasma membrane. Only the nucleus and mitochondria have two membranes, the lysosome, golgi, and ER have one.

Would altered extracellular calcium levels affect neuronal functioning? What muscles contract in quiet/passive vs. active expiration vs. expiration. Without a host cell, can a virus synthesize proteins? What is a diurnal rhythm? How does flow rate increase if pressure is doubled and resistance is increased by 50%? What is adaptive radiation? What causes menopause? Does excess testosterone introduce with male fertility via LH or FSH? Explain the compensation mechanisms for dealing with fever in terms of skin capillary diameter, skeletal muscle activity, respiratory rate, and fluid loss. If blood flow to the pulmonary capillaries was blocked what would happen to the alveolar pco2 and po2.
- yes, decreased calcium levels outside the cells affect those inside the cell and we know calcium is important for neuronal functioning. No, viruses lack the ribosomes required to synthesize proteins. A diurnal rhythm is any sort of rhythm that syncs with the day/night cycle. If resistance is increased by 50% (R*3/2), then flow rate Q becomes Q*⅔, then if you double pressure you double flow rate so flow rate is now Q*4/3, which means it increases 33%. Adaptive radiation is a phenomenon where a

single species that is placed in multiple environments will diverge due to the unique selective pressures that favor evolution for each ecological niche. Menopause is caused by a number of things, mainly the drop in essential reproductive hormones like estrogen, progesterone, and FSH, as well as the finite amount of oocytes running out.
- to deal with an increased body temp (fever), skin capillary diameter increases so more heat can be lost via convection, skeletal muscle activity decreases so less heat is generated by shivering, respiratory rate increases so more heat is lost via panting, and sweating occurs so heat is lost during evaporation.
- alveolar pco2 would decrease and po2 would increase since co2 won't move from deoxygenated blood into the alveolar space and o2 won't move from the alveolar space into the blood.

Official Guide Qs

B/B

How do type 1, 2a, and 2x/2b muscle fibers compare in terms of their contraction time, motor neuron size, fatigue resistance, activity usage (aerobic vs. anaerobic), force production, mitochondria density, capillary density, oxidative and glycolytic capacity, and major storage fuel (glycogen, creatine phosphate vs. triglycerides) compare? What is the final electron acceptor in lactate fermentation?

- type 1 fibers are oxidative, type 2a are oxidative-glycolytic, type 2x/2b are glycolytic. Type 1 fibers have a slow contraction time, small motor neuron size (explains the slow contraction time), high fatigue resistance (consumes fuel stores less quickly), used for aerobic activity, have the weakest force production, high mitochondrial and capillary density, oxidative metabolism, and primarily use triglycerides as fuel. On the other side of things, type 2x/2b muscle fibers have the fastest contraction time, largest motor neuron size, worst fatigue resistance (due to rapid lactic acid accumulation), used for short-anaerobic activities, highest force production, very low mitochondria and capillary density, glycolytic metabolism, and use glycogen and creatine phosphate as their primary fuel. Type 2a muscle fibers are intermediate, they have intermediate contraction time, motor neuron size, and fatigue resistance, used for long-anaerobic activities, intermediate force production, they do have mitochondria and capillaries b/c of their partial oxidative metabolism, but less so than type 1 muscle fibers, oxidative and glycolytic metabolism, and use creatine phosphate and glycogen as fuel. Final electron acceptor in lactate fermentation is pyruvate which is reduced to lactate by the reducing agent NADH

What is the periplasm, what important process takes place here in prokaryotes, how does the propensity for the presence of glycolipids vs. sterols compare between prokaryotes and eukaryotes? What process does kinesin facilitate, does the ER involve vesicle formation? If a bacteria unregulated a protein that confers abx resistance, is it best to treat the bacteria with more abs or use a different one? Do platelets have nuclei? Do platelets have ribosomes? What class of enzyme facilitates the conversion of glutamate to GABA? Is a molecule with more or less epitopes more susceptible to an adaptive immune response? What is a heterotroph vs autotroph?

- periplasm is the region between the inner membrane and outer membrane of gram negative bacteria, and the region between the plasma membrane and peptidoglycan layer of gram positive bacteria.
- prokaryotes generally have far fewer glycolipids and sterols according to AMCAS. We know the eukaryotic plasma membrane has these structures in abundance
- kinesin facilitates anterograde transport of cargo to the cell membrane via microtubules in an ATP-dependent manner.
- yes, cargo is transported from the ER to Golgi via vesicles.
- best to use a different antibiotic, any proteins conferring abx resistance will diminish the effectiveness of the original therapy.
- platelets are cell fragments and lack nuclei, but they do have ribosomes and other organelles since they still contain part of the megakaryocyte cytoplasm.
- glutamate to GABA is facilitated by a decarboxylase.
- a molecule with more epitopes will generate a greater immune response.
- a heterotroph can oxidize complex carbon compounds to fuel, an autotroph needs to use energy (e.g. light) to fix complex carbon compounds from simple carbons like CO2.

C/P

How to calculate work from a force x distance graph, how to calculate PE change when a spring is extended a certain distance, what formula relates power to velocity? Explain how you can figure out the units for the rate constant, e.g. if you have a

reaction with a unimolecular, bimolecular, or n rate. What happens to the pH of a solution when a conjugate base is precipitated out by the addition of an ion it is less soluble with? What is alpha absorption? For the lowest frequency mode of a stretched string, how do you calculate its frequency?

- work will be the area under the force x distance curve. PE change for a spring that is extended will be PE=1/2kx^2, can sub in spring constant (F=kx) to get PE=½*Fx. Power = energy/time = work/time = fd/t = f*v.
- units for rate constant can be figured out using the following formula: A reaction has a rate law of Rate = k*[A]^n where n is the rate order. a zero order reaction simplifies to Rate = k, since rate is always M/s, then zero order reactions have M/S units. For reactions with unimolecular rate laws, Rate = k*[A]^1 simplifies to M/s = kunits * M, solve for k and you get s^-1 units. For reactions with bimolecular weight laws, Rate = k*[A]^2 simplifies to M/S = kunits *M^2, solve for k and you get s^-1*M^-1 units and so on. Generic formula for any rate order is rate = k[A]^n -> M/t = k* M^n -> k units: M^-(n-1)*s-1.
- if the conj base precipitates out there is less conj base to abstract protons from water and make basic solutions, so there will be less [OH-] and the pH will decrease.
- alpha absorption is when a nucleus absorbs an alpha particle.
- the velocity of a wave in a string fixed at both ends is v = sqrt(Ft/ m/L). The fundamental will have a frequency of f=v/lambda, you know the fundamental wavelength from n*theta/2 = L (it is 2L for the first harmonic), so to calculate frequency you get f=sqrt(Ft/ m/L)/2L.

P/S

Does the cognitive dissonance theory believe behaviors or attitudes are more likely to change? If heroin-dependent rats were injected with Narcan, how would that affect the strength of the reinforcing affects of heroin? What is gender schema vs script? What is anterograde vs. retrograde memory in the context of brain injuries?

- cognitive dissonance theory believes that attitudes are more likely to change than behaviors because they are easier to do. Narcan would decrease the enjoyable effects of narcotics for the rats, so the positive feelings that result from heroin use would be even more reinforcing.
- gender schema basically describes how someone understands gender, it encompasses all their beliefs on gender roles, gender scripts, and their own gender identity as well. Gender scripts refer to a sequence of behaviors one associates with a certain gender. Anterograde memories are those that are formed after a brain injury, retrograde memory are those formed before a brain injury.

AAMC FL 2

C/P

Relate energy of a photon to wavelength or frequency. Wavelengths associated with excitation, rotation, and vibration. Are carboxylic acids or alcohols more polar? Is half-life the amount of time it takes for radioactive nuclei to decay into radioactive nuclei? Define stable vs. unstable equilibrium. How to figure out angle for torque problems? Why when standing up does someone move their center of mass forwards, does this change the energy required to stand up? What is mechanical equilibrium? How does the difference in energy between a ground state and excited state reflect the wavelength of photon absorbed? On which phosphate is the gamma phosphate of ATP? Which amino acid is a phosphomimetic? Shape of curve for cooperative processes, what about normal M-M kinetics?

- E=hf = hc/lambda. EMR in the UV-VIS range is associated with electronic excitation, IR range with vibration, radio waves with rotation. Carboxylic acids are more polar b/c they can hydrogen bonds and have an extra oxygen bond for an additional dipole moment. Radioactive nuclei do not necessarily decay into radioactive nuclei, so the appropriate definition is that half life is the time it takes for ½ of a radioactive nuclei to decay into its daughter nuclei. Stable equilibrium is when a slight perturbation from the equilibrium position is followed by restoration to equilibrium shortly after, in unstable equilibrium the perturbation will prevent the equilibrium in such a way that stable equilibrium is not restored.
- remember sintheta for the torque is the angle between the lever arm and angle of the force, to figure this out just look where the angle will be 90 degrees and adjust from there.
- standing up moves our center of mass above the pivot (our feet), in doing so the angle between the lever arm (our torso) and the force (gravity) is 0, so we are in rotational equilibrium. Contrast this to sitting, where there is a positive torque on us due to

weight, but that's balanced out by a normal force exerted by the seat which gives a negative torque. If we were to try standing up without moving the center of mass, there would be a net torque in the positive direction and we would fall. Energy does not change, we still move our center of mass the same amount, thus the potential energy we gain stays the same.
- mechanical equilibrium is when there is both rotational and translational equilibrium. The greater the difference between the ground and excited state, the higher energy photon was absorbed, so if the wavelength of the photon is lower that means the difference between the states is greater than if the photon emitted was high wavelength (low energy).
- the alpha phosphate is closest to the adenosine, then beta, then gamma is the farthest. Glutamate and aspartate are phosphomimetics. Cooperative processes are sigmoidal. M-M kinetics are hyperbolic (not parabolic).

Know the Doppler effect, Venturi effect, diffusion, and dispersion. What is pi stacking, how does it compare between A-T and C-G base pairs? What property allows us to estimate vapor pressure? What type of bond exists in coordinate compounds, give the fancy name and basic name. What is coordination number, what does it mean if a central metal ion has three ligands bounded to it with a coordination number of 6? Net force on a positive charge C when it is centered and above two charges of opposite sign but equal magnitude (left charge is positive)? If a glass rod was rubbed and now has a positive charge, were electrons gained or lost? Know how to use Hess's law to calculate the heat of reaction?
- Doppler effect describes how apparent frequency changes if the source/observer are moving towards/away from one another. Venturi effect describes how the narrowing of a conduit results in elevated flow velocity which means a low pressure in accordance with Bernoulli's principle. Diffusion is the passive movement of molecules down their concentration gradient. Dispersion is a phenomenon whereby light of different wavelengths appears to separate upon refraction due to their different wavelengths. Violet has the greatest refractive index.
- pi stacking describes the weak, non-covalent attractive interactions between aromatic systems. In nucleic acids, this occurs between vertical base pairs. Pi-stacking from G-C base pairs is greater than A-T base pairs because the three hydrogen bonds in the former form "two" extra rings.
- estimate vp from boiling point since the bp is the temp at which vp is equal to atm.
- coordinate compounds have coordinate covalent bonds aka dative bonds where the lewis base/ligand donates both electrons to the bond. Coordination number is the amount of central atom-ligand bonds. If the ion has three ligands but the CN is 6 then the ligands must be bidentate.
- the vertical forces are canceled out and there will be a net charge straight to the right of the charge on interest.
- glass rod must have lost electrons if it is now positive charges.
- Hess's law says Hrxn = sigmaHfproducts - sigmaHfreactants. Just plug in the numbers, but be careful taking the moles into consideration since Hf gives enthalpy/mole.

How does the difference in dB between two sounds correlate to the relative difference in sound intensity? What are the magnification formulas? If you are told a lens has a negative focal length, what type of lens must it be, if an object is located at a distance between infinity and the radius of curvature for this lens or a converging lens, describe the magnification of the image and whether it is real or virtual. Do converging/diverging lenses have negative/positive focal points? Describe the transformation of energy in a battery-powered resistive circuit. Protein secondary structure is characterized by what?
- a 10 db difference corresponds to a 10 fold difference, a 20 db difference corresponds to a 100 fold difference, so an intensity difference of 10^x corresponds to x*10 decibels.
- magnification formulas are m=-di/do=hi/ho.
- the lens must be a diverging concave lens if it has a negative focal length. If the object is located between infinity and the vertex for this lens, the image is SUV, small, upright, and virtual. For a converging convex lens whose object distance is between infinity and the radius of curvature, the image is SIR, small, inverted, real. The magnification in both these examples is inverted and virtual means the image is to the left of the lens, while real means it is to the right of the lens.
- converging lenses have positive focal points, diverging lens have negative focal points.
- in a battery-powered resistive circuit, chemical energy from redox rxns is transformed to electrical energy (electron flow) which is transformed to heat energy as it moves through a resistor with a resistance.
- protein secondary structure is characterized by H bonds between amide and carbonyl groups of peptide bonds.

B/B

Are feedback inhibition and allosteric regulation mutually exclusive (e.g. PFK-1 and ATP)? Function of each glycolytic and CAC enzymes. Where does aldosterone primarily act, what about vasopressin? What are the three stop codons? Can a missense mutation be added near the beginning of the transcript and not have the C-terminal unaffected, what about if it was added to the end of the transcript? What is the main function of the centrosome (aka what is it also known as), explain the relationship of centrioles and the PCM to them, how many centrosomes does each cell have, explain how this changes over the course of the cell cycle (interphase, mitosis). What is the difference between spermatogenesis and spermiogenesis, where do sperm become motile? What is the main function of the prostate gland? Release of what molecule initiates the power stroke? Give the mnemonics for the structures formed from the mesoderm and endoderm?

- feedback inhibition and allosteric regulation are definitely not mutually exclusive and usually work together. The former involves the product of a pathway inhibiting the pathway, the latter involves a molecule binding to a non-active site of a protein to alter its activity. In PFK-1, ATP is the product of glycolysis and signals energy abundance by binding to an allosteric site on PFK-1, decreasing its activity, and thus decreasing glycolytic flux (feedback inhibition).
- aldosterone and vasopressin both predominantly act on the distal nephron, mainly the collecting ducts, but also the distal tubule.
- three stop codons are TAA, TAG, and TGA. no, if a missense mutation is near the N-terminus of the transcript, it causes a frameshift that must alter the primary sequence of the protein downstream from the mutation site, which includes the C-terminal. If the mutation is at the C-term, then yes, it only affects everything downstream, so the N-term is likely to remain unaffected.
- centrosomes are also known as MTOC, the microtubule organizing center, they have a number of roles in cytoskeletal activity, perhaps there best is in the spindle apparatus and separation of chromosomes during mitosis/meiosis. Each centrosome has two centrioles, the PCM (pericentriolar matrix) surrounds centrioles and helps regulate microtubule anchoring and formation. During S phase, the centrosome replicates, each daughter cell gets one of these.
- spermatogenesis is the process of a diploid spermatogonia germ cell undergoing meiosis into a haploid spermatid. Spermiogenesis is when a spermatid matures into a mature spermatozoa that can actually fertilize an egg. Sperm become motile and finish maturing (non-fertile->fertile) as they move through the epididymis.
- the prostate gland secrete fluids that help protect and nourish sperm.
- after a power stroke, myosin is released from actin when ATP binds the myosin head. When ATP is hydrolyzed, the myosin head cocks back. If calcium is present to bind to troponin and remove tropomyosin, the myosin head can attach to actin (high-force crossbridging). When inorganic phosphate is released, that initiates the power stroke. After the power stroke, ADP is released.
- mnemonics for the structures are as follows:
    - BLGGLP - bladder, lungs, GI tract epithelia, glands, liver, pancreas
    - BALDMUCC - bone, adrenal cortex, lymphatic system, dermis, muscle, urogenital organs (e.g. kidney), cardiovascular system, cornea and lens
    - NEPNA - nervous system, epidermis, pituitary gland, adrenal medulla, nasal/anal/oral/epithelium.

P/S

For someone who perceives a spectrum of colors categorically, how does their %green response vs. wavelength compare to those who perceive colors continuously? After WW2, what happened that has resulted in the percentage of older folks increasing over the last few years, what year range was this population group born in? When was the sexual revolution and what was it? What is retrograde amnesia? What are the two main characteristics of a dissociative disorder? Define marginal poverty vs. structural poverty. What is a health indicator? Briefly explain what else social and cultural capital can refer to in a non-social reproduction context.

- those who view color categorically would categorize colors along the spectrum as either green or blue, those who perceive them continuously (not categorically) would view the colors along the spectrum as either blue/green depending on where they were in the spectrum, thus the %green response vs. wavelength would be a line with a positive slope from the lowest wavelength (most blue) to the highest wavelength (most green).
- after ww2, the fertility rates increased, this was the baby boomer generation. They were born 1946-1964.
- sexual revolution was the 60-80s and describes a time where positions on sex and other attitudes shifted.
- retrograde amnesia is forgetting previously learned info. Usually it begins with the most recently learned old info.
- dissociative disorders are characterized by disruptions of memory and identity.

- marginal poverty is poverty b/c of one's inability to hold a job. Structural poverty is poverty attributed to the social or economic system, e.g. there are plenty of jobs but they are low-paying jobs, so even though the unemployment is low, most folks are living in poverty.
- a health indicator is something that when assessed provides insight into the health status of a certain population.
- social and cultural capital can describe assists that help people ascend the social ranks (social mobility).

How would info that is assimilated into a schema vs. that which requires accommodation into a schema differ in the time it takes for a response to them on an IAT? What is drug craving vs. tolerance? Compare hallucinogens, sedatives, stimulants, and alcohol in terms of their likeliness of causing addiction. What are the age ranges for Freud's psychosexual theory? How is confirmation bias similar to groupthink? Are vocabulary skills, emotion processing, music perception, and visuospatial skills lateralized to the right or left hemisphere? What is the misinformation effect? How does emotional intelligence facilitate one's goal-oriented behaviors. What are the three types of emotion in Sternberg's Triarchic theory and Thorndike's theory? In conditioning, what is shaping? Which sociological perspective believes in latent and manifest functions? The idea of self-concept best aligns with which sociological perspective? Medicalization describes terms being described in such a way that they are perceived as a medical problem that requires a medical intervention to fix. What is exchange mobility?
- assimilated info in the schema would have a shorter response time on the IAT b/c it is more familiar. Info that does not fit into a schema and may have to be accommodated will likely require a longer response time.
- drug craving is when one feels the urge to use the drug. Tolerance is a physiological response to repeated drug use that results in a drug having a diminished effect.
- we know sedatives like opiates are addictive, stimulants like cocaine are addictive, alcohol is addictive, so the best choice out of this is hallucinogens. Hallucinogens are known for being less addictive than other drugs.
- age ranges for Freud's psychosexual theory are oral (0-1), anal (1-3), phallic (3-6), latent (6-puberty), genital (puberty-adulthood).
- confirmation bias is when folks seek out info to confirm their viewpoint and avoid/ignore info that opposes it. A similar process occurs in groupthink since the various mechanisms involve seek to strengthen majority opinions and diminish minority opinions.
- vocab skills are associated with the left hemisphere and its language areas. Emotion processing, music perception, and visuospatial skills are associated with the right hemisphere (think of left handed individuals).
- misinformation effect is when one's recollection of an episodic memory becomes less reliable due to interference from info that was learned after the event.
- Sternberg's Triarchic theory has CEP (componential/analytical, emotional/creative, practical), while Thorndike's theory has abstract, mechanical, and social intelligence.
- shaping is when individual steps towards a goal behavior are rewarded. This makes it more likely for complex behaviors to be learned.
- functionalist perspective believes everything has a function, some latent, and some manifest.
- symbolic interactionism emphases the development of one's own symbolic world through symbols and language, which best aligns with the self-concept (how one thinks of themselves).
- yes, the definition of medicalization here is appropriate. Exchange mobility describes how there is a finite amount of positions for each social strata. If some people move into a higher strata, some have to move out of that high strata and fill in the gaps.

AAMC FL 3

C/P

Aldol rxn vs condensation mechanism, Michael addition, Robinson annulation (is the a,b-unsaturated ketone a nucleophile or electrophile? If a car's travel is being opposed by a kinetic friction force of 1000 N, how much power is required to keep the car moving at a constant speed of 50 m/s? Is heat of combustion positive or negative, how does its magnitude (which one is more positive/negative) correlate to reactant stability, explain the difference in terms of the amount of energy required to break the bonds of the more stable reactant. Activation complex vs. transition state? How do uniform vs. nonuniform electric field lines compare? Acidity of monosodium phosphate vs. disodium phosphate? What is acetylation? Compare n6-methyl/dimethyl/trimethyllysine structure. Describe the dipole in a peptide bond. Furan vs. pyrrole, which heterocyclic aromatic compound is the basis for the porphyrin ring of heme? In terms of a protein becoming unfolded, how would pK correspond to efficiency?

- aldol reaction is just the formation of an enolate followed by its nucleophilic attack of a carbonyl group with formation of the hydroxyl to form a b-hydroxyketone rather than a subsequent dehydration which would be the aldol condensation (condensation = loss of water) to form an a,-b-unsaturated ketone.
- michael addition has a 1,4-addition mechanism where an enolate attacks an a,b-unsaturated carbonyl to form an enol that tautomerizes with its keto form to form a 1,5-diketone. Robinson annulation is just the combination of a michael addition and an intramolecular aldol condensation to form a usually 5- or 6-membered ring. In the robinson annulation, the a,b-unsaturated ketone is an electrophile since it undergoes nucleophilic attack from the enolate during michael addition, but then it becomes a nucleophile when it is deprotonated into an enolate that serves as the nucleophile to attack a carbonyl for ring closure.
- newton's first law says to maintain a constant speed there needs to be a net force of 0, so in this case a force that opposes the kinetic friction force must be added, since the kinetic force is doing negative work of -Fd which translates to a power = -Fd/t = -Fv the applied power to cancel this out must be power = +Fv = 1000 N *50m/s.
- heat of combustion is always negative, the more negative it is the more energy is released which means the reaction is more exergonic. this means the initial reactants were less stable and had a higher Hfreactant which is what resulted in Hrxn = Hfproduct-Hfreactant being more negative. More energy is released for the less stable reactant's combustion because more energy is required to break apart bonds in the more stable (lower energy) reactant.
- activation complex and transition state are similar, except the former is a range of transition states near the peak energy of a reaction step, while the transition state is the highest energy.
- uniform electric field lines are always at equal distances from each other, the electric field is nonuniform if its electric field lines vary. Monosodium phosphate is NaH2PO4 so it is more acidic than Na2HPO4 b/c more protons always means more acidic for a polyprotic acid.
- acetylation is adding an acetyl (R-C(O)- x) group to a molecule, where the x acts a nucleophile and attacks the electrophilic carbon displacing the substituent that was there.
- unmethylated is normal lysine that is fully protonated at physiological pH (3 protons), methyl is lysine with one methyl group for an H, dimethyl is two methyls, trimethyl is three methyls.
- dipole in a peptide bond is negative at the oxygen that is more electronegative than the nitrogen that is where the positive aspect of the dipole moment is. Furan is five-membered aromatic ring with the oxygen heteroatom, pyrrole is the five-membered aromatic ring with the nitrogen heteroatom. Porphyrin ring has a modified pyrrole group. K is the equilibrium constant for native to unfolded so a larger K corresponds to a more exergonic rxn for the unfolding process and thus a lower pK

B/B

What are squares vs circles on a pedigree? Compare homologous vs. analogous structures, which one of these structures does convergent evolution tend to result in? Are dolphins and sharks an example of convergent or divergent evolution, explain why. Explain what hormones are involved in the stress axis, GH axis, thyroid axis, and reproductive axis. In terms of bonds, what does primase do? Is a protease a lyase or a hydrolase? How many promoters does a polycistronic mRNA have, how does it actually result in multiple different proteins? Mechanism by which HDACs affect gene expression?

- squares are males, circles are females. Homologous structures are structures in different organisms that appear similar b/c of their derivation from a common ancestor, they may not necessarily be analogous, which refers to structures that are functionally similar. Convergent evolution describes a similar selective pressure resulting in distantly related organisms becoming more similar, usually leads to the development of analogous structures. Dolphins are mammals and sharks are fish, they swim, have fins, etc., which is an example of convergent evolution from distant ancestors. Stress axis is CRH->ACTH->cortisol, GH axis is GhRH(hypothalamus)->GH(anterior pituitary), thyroid axis is TRH->TSH->TH, reproductive axis is GnRH->gonadotropins->testosterone/estrogen.
- primase synthesizes an RNA primer, so phosphodiester bonds between ribonucleotides, that are complementary to the DNA strands being synthesized. A protease hydrolyzes peptide bonds which makes it a hydrolase, remember that lyases are characterized by formation of rigid structures like rings or double bonds (e.g. aldolase).
- a polycistronic mRNA is off of one promoter, the polycistronic transcript is translated shortly afterwards and the different peptides can be synthesized sequentially, being separated by intercistronic regions each with their own transcription start sites, or it can be one long peptide that folds into a multimeric protein.

- HDACs deacetylate lysine, this results in the residues being positively charged and thus attracted to negatively charged DNA backbone, causing it to condense and be less accessible by transcription machinery.

How does starvation cause ketogenesis, why is keto genesis benefit in terms of energy (think brain) and affecting the amount of free CoA. Which steps of gluconeogenesis require an energy input? What is the Cori cycle? Formula for osmotic pressure? Do all restriction enzymes recognize palindromic sequences, OK, but ACCORDING TO AAMC do they only recognize palindromic sequences, what is AAMC's recommendation for length, what is a palindromic sequence in the context. What is genomic imprinting, what mechanisms are responsible for it? What is optimal temp for most enzymes? What class of tissue are goblet cells, what class of tissue produces mucus?

- starvation leads to glucose from glycogenolysis being saved for the brain, thus there is less oxaloacetate by way of pyruvate carboxylase activity and a shortage of glucogenic amino acids like aspartate which can be transaminated to oxaloacetate. Together, this decreases flux through the CAC. to prevent acetyl-Coa build up which would decrease FA oxidation and possibly lead to FA build up as well as poor fuel usage, ketogenesis occurs to flux acetyl-CoA into ketone bodies that are exported for extrahepatic use as fuel. This facilitates continued flux of FAs via beta oxidation, while also freeing up limited CoA as they are released during ketogenesis.
- gluconeogenesis requires energy input at pyruvate carboxylase step (pyruvate->oxaloacetate) due to the conversion of bicarbonate to CO2, the PEP carboxykinase step due to a phosphate being added to oxaloacetate from GTP as CO2 is lost, and the phosphoglycerate kinase conversion of 3-PG to 1,3-BPG. Remember the f16bpase is a hydrolysis reaction.
- Cori cycle describes how muscle can use glucose via glycolysis to generate 2 ATP then do lactate fermentation to reproduce NAD+ for continued substrate-level phosphorylation in glycolysis, but the key is that the lactate is exported to the liver where it undergoes gluconeogenesis (6 ATP required for 2 lactate), thus placing the gluconeogenic load on the liver.
- osmotic pressure formula is pi=i*M*R*T.
- no, there are non-palindromic sequence recognizing REs, but according to the AAMC they want you to think of it in terms of palindromes, AAMC describes REs as 4-6 bp, a palindromic sequence is one whose complementary strand reads the same as the template.
- genomic imprinting describes a parent-specific gene expression, ex IGF-1 gene is only expressed from the paternal allele even though they are autosomes and present in two copies in all offspring, this genomic imprinting is often due to an epigenetic mechanism like silencing by methylation.
- optimal temp for most enzymes is RT which is 37dc aka 310k
- goblet cells are epithelial tissues, epithelial tissues secrete mucus

P/S

What do social psychologists believe about how likelihood of attraction is affected by proximity, similarity, attractiveness, and reciprocity? What is prospective vs. reproductive memory? Phenomena responsible for intrusions during memory recall? What is emotional memory enhancement, what did Easterbrook believe about emotional arousal's effect on attention and the resulting "trade offs." Main function of sclera? What category of the DSM-5 is illness anxiety order located, what exactly is a somatic symptom disorder. What type of radiation do MRI vs. CT use?

- there's a greater chance of attraction with closer proximity, greater similarity, higher attractiveness, and reciprocity in feelings (both people have feelings for each other). Prospective memory is remembering to do things you planned for the future, reproductive memory describes memory that is actually recalled, it is the opposite of reconstructive memory. Memory reconstruction is responsible for intrusions that characterize false memories.
- Emotional memory enhancement is a phenomenon that describes how we have better memory of events that were emotionally arousing than those that weren't. Easterbrook believed that emotional arousal leads to a focused attention on the characteristics of a stimulus that elicits the emotion (central details) rather than other peripheral details. The trade off is that you have enhanced memory of the details that were most important to you but less so of peripheral details. In fact, emotional arousal can lead to a decreased accuracy of recalling peripheral details than in the normal condition.
- sclera is mainly a physical barrier for protection. DSM-5 is a somatic symptom and related disorder, which are disorders characterized by physical symptoms which lack a general health or medication-related origin, including being associated with

another psychological symptom (e.g. panic disorder), causing it to be classified into its own group of disorders. MRI doesn't use radiation it uses magnetic fields, CT uses x-rays.

Are operant and classical conditioning associative or non-associative learning? Would conflict theory be more associated with social control or social solidarity? Define structural mobility. What is self-verification. What is the Myers-Briggs inventory. Which neurotransmitter mediates aggression, does it have any effects on hunger? What is self-determination theory? Per AAMC logic, should you consider role conflict over role strain if a second role is not explicitly mentioned? If someone can't balance on one food with their eyes closed, is this an example of the vestibular sense or sensory interaction? What is perceptual adaptation vs. maladaptation?

- both operant and classical conditioning are associative learning where behaviors/stimuli are associated with stimuli. Habituation and desensitization would be non-assoxicative learning. Conflict theory is more associated with social control because it wants to limit unrest among the proletariat that may lead to an anti-thesis revolt, social solidarity is not really the goal of conflict theory, they want to maintain the class inequities, although social solidarity can be sort of interpreted as ensuring that happens, it's not the best answer.
- structural mobility describes how structural changes in a society can result in vertical mobility of its group depending on the restructuring. Self-verification describes how people want others to see them as they see themselves, this can lead to people rejecting/criticizing other peoples' views of them if they don't align with the person's self-concept.
- Myers-Brigg Inventory test is a personality test that gives someone a score of four letters that can result in one of 16 combinations.
- serotonin mediates mood and aggression, though glutamate is also sometimes implicated. serotonin also regulates satiety and gut contraction.
- self-determination theory just describes how people are motivated to pursue three innate needs: competence (ability to do things), autonomy (can control their outcomes), and relatedness (relationships with people).
- if there is not a clearly stated second role then it is almost always going to be role strain rather than role conflict.
- vestibular sense is attributed to balance and spatial orientation, but this is an example of it working with the visual system and thus an example of sensory interaction.
- perceptual adaptation describes how one can adapt to a new environment by blocking out distracting sensory info and only perceiving info that is important, perceptual maladaptation is when this perception puts someone at a disadvantage.

AAMC FL 4

C/P

How to quickly tell if entropy change for a rxn whose equation you are given? How does the lens you use to fix myopia/presbyopia compare in terms of their radius of curvature? Structure of a carbamate? Does NaBH4 reduce esters? What does it mean if an enzyme-catalyzed reaction's substrate binding is random order, ordered, vs. ping pong/double-displacement, which of these have a ternary complex? Three ways to minimize absorbance in accordance with Beer's law? Amp per hour is a unit of what? Why is the electric field inside a capacitor zero, is it free or bound electrons? Where do graded potentials develop, are they depolarizing or hyperpolarizing?

- look to see if any moles of gas are formed, if there is a net increase in gas molecules then there is an entropy increase. You fix myopia with a concave diverging lens, while you fix presbyopia with a convex converging lens, the more converging the lens the smaller its radius of curvature, so to fix presbyopia you use a lens that decreases the radius of curvature, vice versa for farsightedness.
- a carbamate is a carbonyl with an amide and ester moiety: H2N-C(O)-OR. NaBH4 does not reduce esters, only LiALH4 will.
- random order binding means the enzyme binds at least two substrates and can do sequentially in any order, ordered binding means the binding of the substrate has to have the same sequence each time (e.g. A->B), in the ping-pong/double-displacement mechanism, an enzyme binds substrate A, converts substrate A to P, which causes the enzyme to undergo a conformational change to an intermediate which can then bind B, which the enzyme converts to a second P, before returning to its original conformation. All but the ping-pong can have a tertiary complex (enzyme + two substrates).
- minimize absorbance by minimizing molar absorptivity, concentration (e.g. by adding more solvent for dilution), decrease path length.

- amp per hour is another unit of charge since Coloumb/time * time = coulomb. Electric field on a capacitor is 0 because all free electrons repel each other to the surface of the conductor, thus the electric fields each cancel out to have a net field of 0.
- graded potentials develop in cell body or dendrites, they do not propagate down axons because they are not action potentials.

B/B

What do cytochrome P450 enzymes do to substrates? RLS of fatty acid oxidation? Henry's law? Where are leptin/ghrelin secreted from? What is ADP-ribosylation? Should an immunogen used in vaccine development be toxic? In a ribosome, what binds the P and A sites? What are the Shine-Delgarno and Kozak sequences? What is gel filtration chromatography also known as? If a nine-mer peptide was hydrolyzed into three tripeptides, in how many ways could those peptides be joined together? Does replication of the inactivated X chromosome occur before or after its counterpart, does this trend extend to other chromosomes? Besides the kidneys, what are the two other main ways we lose excess water? Are microglia involved in the innate or adaptive immune response? GABA binding to its receptor does what? Three names of stop codons? What is the purpose of a test cross?

- cytochrome P450 enzymes oxidize substrates using oxygen as the oxidizing agent. Rls of fatty acid oxidation is carnitine acyl-transferase-mediated conversion of the fatty acyl-coa to a fatty-acyl carnitine with its transport into the mitochondria. Henry's law is C=kP, relates conc of a dissolved gas in a solution to its partial pressure above the solution. Leptin is secreted by the adipose tissue, ghrelin is secreted by the stomach. ADP-ribosylation is the transfer of an ADP-ribose group to a substrate. Even though you want the immunogen to elicit an immune response, you don't want it to be toxic to the host, so for example you wouldn't use an antigen from a pathogen that is toxic as a vaccine b/c although that could elicit an immune response it can also damage host cells. In the ribosome, p is wear the peptide is, a is the accept site for a new loaded tRNA, and then aminoacyltransferase mediates transfer of the peptide to the loaded trna in the A site. The new peptide then shifts to the P site. Shine-Delgarno and kozak sequences are translation initiation sites in prokaryotic and eukaryotic sequences.
- gel filtration chromatography is also known as size-exclusion chromatography. If the nine-mer peptide was hydrolyzed into three tripeptides, the three tripeptides can be combined into 3! = 6 different ways.
- Xi is replicated in late S phase after the non-inactivated chromosome, in general euchromatin is more easily replicated than heterochromatin, such as the inactivated X chromosome. Water is lost through the kidneys, respiration (hydrating incoming air), and skin (transepidermal water loss). Microglia are innate immune cells. GABA receptor opening allows the influx of chloride ions and thus hyperpolarization. Stop codons are amber, ochre, and opal/umbre. A test cross is used to figure out an unknown genotype by crossing that unknown genotype with the known genotype of someone demonstrating a recessive phenotype.

P/S

What is a discriminating stimulus, note I am not talking about general stimulus discrimination. What do traditional behaviorists believe about the influence of cognitive processes? What is a fallacy, what is the base rate fallacy (give an example), define public verifiability. Where is the vitreous humor, compare the function of the lens, pupil, iris, and aqueous humor. What is the overconfidence effect? How does increased group conflict affect in-group vs. out-group bias, what about self-reliance vs group cohesion?

- a discriminating stimulus is the stimulus that is associated with a behavior that has been reinforced/punished, ex is if you present someone with a red card that they touch which leads to a shock vs. a blue card that they touch without a punishment, the discriminating stimulus is the red card because the person associates that stimulus with a response that they deem good/bad. This differs from stimulus discrimination which is the opposite of stimulus generalization. Traditional behaviorists do not believe that there is any significant influence from cognitive and mental processes, they believe behavior is ultimately determined by the reinforcements/punishments that they are accompanied with. A fallacy is an irrational thought process. Base rate fallacy describes how folk's tend to believe individualized info rather than general info if they are presented with both, example if we are told only 2% of individuals get into med school, but you think you are special and will get in regardless, that is an example of a base rate fallacy. Public verifiability applies to research studies and just describes how the public tends to verify results (usually those from research studies).
- vitreous humor is in the vitreous chamber between the lens and retina. Lens fine-tunes incoming light, pupil is where light enters through, iris controls size of pupil and thus how much light enters, aqueous humor nourishes the cornea and lens.
- overconfidence effect describes how people believe their information or judgements are more accurate than they actually are.

- increased group conflict leads to increased in-group favoritism and greater out-group derogation b/c people look to their groups for support during these moments, a similar reason explains why increased group conflict leads to more group cohesion rather than self-reliance.

During what stage of Piaget's theory of development is there imaginative thinking? What is primary vs. secondary deviance, which deviance theory are these concepts associated with? According to Weber, what is the main difference between a status group vs. social group? Explain the distress, maladaptiveness, statistical deviance, and violation of social norms criterions for abnormality. Define gender socialization, historical research, naming explosion, overextension, categorical perception, semantic bootstrapping, elaborative encoding, disinhibition, prosocial behavior.

- imaginative thinking is characteristic of the preoperational stage. Primary deviance is deviance that does not result in any long-term consequences for the person who performed the deviant behavior, secondary deviance is deviance that results from someone being labeled as a deviant individual causing a self-fulfilled prophecy where they engage in deviant behaviors. Both these deviance terms are associated with labeling theory.
- Weber believes status describes the non-economical aspects that contribute to someone's status, such as race, ethnicity, interests, etc., while social group is the economical aspects.
- distress is bad stress, while maladaptive specifically describes something that is harmful because it affects someone's ability to perform functions required for the ADLs, statistical deviance is behavior that is deviant because it is not commonly performed, violation of social norms is behavior deemed deviant b/c it goes against social norms.
- gender socialization describes the process by which people come to understand how gender is perceived in their society, the roles associated with it, etc. historical research is research that investigates the circumstances, influences, etc. of events that have already happened. Naming explosion describes a period in language development where kids rapidly acquire new speech, overextension is the opposite and describes the tendency for kids to use the same terms for similar objects, e.g. naming all animals dog. Categorical perception is a phenomenon whereby if someone is presented with a stimulus along a spectrum they tend to perceive that range of stimuli into two categories which can be seen as an abrupt switch during perception on a graph. Semantic bootstrapping describes how language builds on top of itself, kids start by understanding words and associating those word with syntax, such as nouns, verbs, adjectives, etc., then using that knowledge to construct sentences and better understand language, it is an inductive process. Elaborative encoding describes how people can more easily encode info if they associate it with previous stored info, ex if I'm trying to remember a psych term from earlier I associate it with the context where I remember seeing it to try and parse out the finer details. Disinhibition describes the inability for people to prevent partaking in harmful, unwarranted, etc. behaviors, like binge drinking. Prosocial behavior is behavior that helps others.

Repeat Section Bank

C/P

What is bond enthalpy, how does its magnitude correlate with stability? Given the energy of an incident photon, how can you calculate the KE of an ejected photoelectron? What is a phosphoric acid vs. phosphatide? If two random things were mixed, and an intermediate formed, is that more likely to suggest thermodynamic or kinetic stability? Gibb's free energy formula? What is the affinity constant? How does an uncompetitive inhibitor affect km and vmax compared to a competitive inhibitor and mixed inhibitor? If a peptide sequence is given, the presence of what residue makes it more likely for a dimer of that peptide to covalently bond?

- bond enthalpy is another term for BDE, the greater its magnitude the more stable the reactant since more energy is required to break its bonds. To calculate the KE, subtract the work function of the electron from the energy of the incident photon. Phosphoric acids have a phosphorus atom doubly bound to an oxygen and singly bound to two hydroxyl groups, phosphatides have glycerophosphate head groups bound to a nitrogen containing group. Intermediate signifies a stable product, thus according to AAMC this would be a thermodynamic product since it doesn't revert back to the reacts (two initial random things). Gibb's free energy is dG=dH - TdS. affinity constant is the inverse of the dissociation constant, the higher it is the more affinity a ligand binds its substrate.
- uncompetitive inhibitor binds to ES complex and decreases Km while decreasing Vmax, competitive inhibitors increase Km but does Vmax, noncompetitive inhibitors all decrease vmax but have varying effects on Km, mixed inhibitors are a type of noncompetitive inhibitor that bind the allosteric site on free enzyme and ES complex equally well, so they decrease vmax with no change in Km.

- presence of cysteine makes it more likely for a dimer to form a disulfide bond.

B/B

What class of enzymes are phosphorylases. When a problem asks about genotyping and southern blotting, what should you automatically think of in terms of MCAT think? What is the genome of a retrovirus, what is autophosphorylation.

- phosphorylases are transferases because they transfer a phosphate to a substrate. Always think RFLP when you see genotyping and southern blotting. Retrovirus has a +ssRNA genome, autophosphorylation is when a kinase phosphorylates itself

P/S

Is attention more likely to involve the thalamus or hypothalamus? Is pain relief more associated with heroin or cocaine?

- attention is more likely to involve the thalamus because one has to pay attention to relevant sensory info which must be relayed, hypothalamus is usually associated with unconscious processes. Pain relief is associated with opiates like heroin rather than stimulants like cocaine.