BIO 228 Exam 2

✓ **It is important that you HIGHLIGHT all of your answers. Choose a *power color that* <u>is readable</u>*, please*!**

✓ **Please don't forget the CONNECT Timed Portion.**

✓ **Your paper is due the end of this week.**

Thank you for your valiant efforts this fall! I know you are well equipped to succeed on this exam.

1. Please take a moment to write/type something positive about your work in preparation for this exam. **Yes, it is a question I am asking you to answer.....**

Would NOT call it positive. Been completely swamped since the end of February and am probably the least prepared I've ever been for and Anatomy/Physiology Exam…

2. Spring Break is right around the corner. You totally need a break (don't we all?!). You go hiking and biking in Colorado. You thought you were pretty fit, back in MI- riding your Fat Tire bike and running a few days a week. Your breathing is suffering on the trails in Colorado! Wowza!

Please explain... What is going on with your breathing, at altitude? **Use the terms <u>concentration</u> and <u>atmosphere</u> and <u>oxygen</u> correctly, and underline each.**

<u>Simple rule of thumb. The higher you are on the planet, the lower the pressure. The lower the pressure, the lower the concentration of all molecules that are present in the atmosphere, oxygen being just one of them.</u>

The problem is that the human body gets accustomed to a certain pressure at which is maintains homeostasis. Because of the drop in pressure, and atmospheric oxygen concentration that takes place when one goes to higher altitudes. The more breaths one simply has to take to get the same amount of oxygen when at a higher elevation.

With that said, the reverse phenomena is seen when a person travels from an area of high elevation to low.

3. You realize that you didn't pack enough water to bike all day in the mountains. When you get back to your rental car, you chug an entire liter of water. **Is this a good idea? Why or why not? Please explain, using the terms <u>homeostasis and concentration.</u> Yep-underline, please**

Speaking from experience, water after such a hike is the best tasting substance on the planet.

Jokes and humor aside, it's not the worst idea. By the time she returned from the trip, she is most likely extremely dehydrated, and her blood is by extension very concentrated. By extension her blood's ph has likely shifted to become more acidic. While taking the water in gradually would allow her body to absorb it at a more relaxed pace, the reality is that she needs to restore her fluid levels to a baseline concentration, and thus return her to homeostasis by restoring both the volume and ph to normal levels.

4. You also realize you haven't urinated since breakfast. Uh oh**!-please recall (explain to me) the "counter current mechanism" here. Feel free to draw it out. Include anatomy (regions of the kidney and shape of the Loop) as well as physiology-what is happening?**

The *counter current mechanism*: Quick overview: The body adds salt to various parts of the fluid that goes through the kidney, typically the Loop of Henle, in order to concentrate the waste products and retain fluid. Salts are pumped in-> the highly osmotic fluid collects at the bottom of the loop before working its way up where the salts are recollected and the water that remains drains into the collecting ducts, where it is further concentrated as it travels to the bladder to be expelled.

5. Your patient Tiffani has been fainting when she stands up, which has her really stressed out and as a result, not sleeping very well. You notice she has low BP.

a. From where do you take her BP? (Which vessel do you use?)

Brachial artery.

b. What is the difference in the two numbers, and what does each number tell us?

Systolic: Top: The maximum blood pressure during the contraction of the ventricles.

Diastolic: Bottom: The minimum pressure recorded just before the next contraction.

c. Give an example of what we might see for Tiffani's BP.

Based off of what I'm seeing, this is a textbook case of *orthostatic hypotension.* She stands up and her BP, let's just use the textbook 120/80 as a baseline since we don't have her typical numbers listed here. She is probably dipping down to around 90/50 when she stands up before things return to normal after a minute or two.

d. After talking to Tiffani, you determine that she drinks alcohol every night (one glass of wine after dinner) and drinks two large cups of coffee each morning. She is a teacher. Why (diagnose) do you think her BP is low?

She's probably dehydrated. While Alcohol and Caffeine have opposing effects (depressant vs stimulant). They both have a diuretic effect. The low volume of her blood is probably what is causing her bp to be low. However, he use of both is likely a response to the environmental stress that is her job.

e. What should happen in her body to compensate for this low BP? Give organs and the hormones they release:

Her adrenal cortex is likely releasing more aldosterone into her system in order to preserve fluid volume.

f. What is the role of each of the above hormones?

The role of aldosterone is to prevent water excretion in the kidneys by binding to the mineralocorticoid receptor (MCR) in the distal convoluted tubule. This would normally allow the passage of ions and fluid into her (DCT) and thus conserves water.

g. You decide to give Tiffani a urine test. What do you expect to see/smell/find?

Depending on her fluid consumption, I would expect to see it appear concentrated. I would expect it to have a proportionately strong odor, and run through a urinalysis, I would expect the waste products to be proportionately concentrated.

h. What do you suggest for Tiffani's low BP?

I would tell her to cut back on her caffeine and alcohol consumption. I would also tell her to drink more fluid throughout the day as it will help her to maintain a healthier BP by increasing her blood volume.

i. You know that Tiffani needs two REM cycles a night to clear her blood-brain barrier. What do you suggest for Tiffani's stress? How can she decrease the body's symptoms and help her sleep better and longer?

By cutting back on her caffeine/alcohol consumption, she will improve her quality of sleep, and thus increase her baseline energy levels. What I would advise her to do is to begin focused breathing exercises as a means of focusing/controlling her stress. As well as trying to incorporate more exercise into her lifestyle.

Are you highlighting?

6. Your patient, Rachelle is 58. She is traveling to Spain in a week so wanted to take a COVID test. She didn't have her glasses on and accidentally took a pregnancy test instead of a COVID test and found that she is pregnant, which she knows is impossible. Is this a false positive test?

Yes or no. *Explain her results, please*. (2 parts)

1: This is defiantly a false positive pregnancy test.

2: Pregnancy tests work by searching for the presence of Human Chorionic Gonadotropin hormone. There is some scattered evidence that Covid-19 can cause an increase in this hormone's concentration within the urine, which could explain why she had a "positive" pregnancy test.

4. Please differ between **acquired response** vs. **innate response.** What is a vaccination, and why? Use each of these terms (and underline).

Innate Response: The body's underlying mechanisms that increase the resistance to foreign pathogens.

Acquired Response: Conditioned responses that increase the body's ability to fend off pathogens.

Vaccination is the process of introducing a neutralized version of a pathogen (most often a virus) into the body in order to trigger a limited immune response. While the immediate effects of this response may be unpleasant, it is often considered a muted response relative to what the effects of the pathogen would otherwise be.

5. We are bombarded by ads that tell us to take an aspirin if our temp rises, or take a Benadryl to stave off itchy eyes and runny noses. Is inflammation good or bad? Explain.

At an overall level, much like the process of vaccination, inflammation is an unpleasant process with a net positive benefit (ie inflammation is generally good). Inflammation is often the body's natural response to either injury or the presence of a pathogen. And while these medications may treat the inflammation, there's a case to be made for saying that they may be stretching the process out longer than is necessary.

7. You are on a research team and working on a vaccine for the COVID Omicron variant. As you meet with your young, unexperienced team, you explain cell-cell signaling regarding viral recognition. You give examples of cell-cell signaling regarding blood types and infusions, COVID, and the decades old HIV virus.

Please explain cell to cell signaling and use (and underline) the term opsonization, MHC and epitope.

Cell to cell signaling is the transfer of information from one cell to another, either by direct contact or the release of a substance from one cell that is take up by another. In the case of blood typing, there are surface level of the MHC proteins.

When the body is attempting to rid itself of foreign pathogens, it utilizes *epitopes (a group of chemicals, most often amino acids),* to recognize whether or not a cell is native to the body. Once it is determined that a cell is foreign, an Opsonin (antibody) will bind to the epitope, and opsonize (consume) the foreign body. What makes HIV so dangerous is that is can essentially hide from the body's immune within plain sight. By manipulating the cell signaling pathways, it conceals its presence as it gradually withers away the host's immune system, and only become visible once the patient has become gravely ill.

Excellent work! Be sure you've highlighted your answers.
Give yourself a well-deserved pat on the back.