

BIO 228 Exam 1 Part A: Hard Copy

Part B, Timed portion is found in McGraw Hill CONECT (40 Q. in 50 minutes)

*1st and last name here: **David Welsh**

PLEASE note: This is due, submitted on Sunday, by 5. NO google docs (I cannot read them on Moodle), and NO LATE Papers. It is of utmost importance that you read through ALL directions and answer all parts of each question in order to get full credit.

PLEASE be sure to highlight your answers. Many thanks! I know you will do a great job!

1. You were probably told not to take steroids for body building and athletic endeavors. However, one might take steroids for a very bad case of poison ivy. Why does the steroid provide relief *so quickly*?

The cell membrane is primarily composed of a phospholipid bilayer. The backbone of a steroid is a hydrophobic, lipid based molecule that can passively diffuse across the cell membrane, unlike hydrophilic molecules that require a means of carry them across the cell membrane.

2. Please describe the HPA axis. Tell me which organs are involved, what they release, and what each triggers (3 things). Thank you!

HPA Axis: The Hypothalamic, Pituitary, Adrenal axis, is for all intents and purposes what governs the body's stress response. It essentially functions as a cascade.

The Hypothalamus releases CRH (Corticotropin Releasing Hormone).

-> This triggers the pituitary to release ACTH (Adrenocorticotrophic Hormone) into the blood stream.

-> -> Which in turn causes the Adrenal gland to release Cortisol and Corticosterone.

-> -> -> This causes energy stores to be released, and facilitates the "fight/flight" response.

Typically this system is brought on as a response to what is perceived to be an external threat to one's life, or at least safety, such as seeing a large predator (bear), or being trapped in a place and approached by someone you'd otherwise cross the street to avoid.

3. Your patient, John, has passed out multiple times this past week, while working in his garden. His BP is low. What is BP, and how is it different from HR? How does John's endocrine system work with his blood to *regulate blood homeostasis*, rather John's low BP?

BP: Blood Pressure - The amount of pressure that is exerted on the blood vessels as a result of the blood that is circulating throughout the body. This is basically what causes blood to reach the points it needs to within the body in order to supply O₂ to the tissues, and is consequentially responsible for why John is passing out. It is worth noting that a low HR can cause blood pressure to be low, and thus could cause episodes of syncope, though it's unlikely to be what is causing John to be passing out.

The endocrine system is essentially responsible for the production of erythrocytes (red blood cells), as well as to maintain the fluid balance that is necessary to maintain blood pressure.

In the case of the latter, this is primarily managed through the RAAS (Renin Angiotensin Aldosterone System). In this process the kidneys release renin into the blood. When the liver senses this, it releases Angiotensin

1/2, which then triggers the Adrenal Glands to release Aldosterone. Aldosterone triggers Na⁺ uptake, which increases water reabsorption. This extra fluid within the body helps maintain BP. (This is also why it is common practice to pump a 0.9% saline solution into the bodies of people experiencing low BP).

4. A horrible car accident occurred on 131, in the tornado last August. You were working a shift in ER, and blood transfusion is required for a number of patients. A student from BIO 228 is shadowing you, so you explain to him WHY _____ is the Universal Donor. (Fill in the blank, and explain, please). A good answer would NOT include "because it can be given to anyone". I already said that when I said....."Universal Donor".

Despite being one of the rarer blood types, O- is the universal donor. This is because O- blood has no surface antigens, and thus nothing for the body of the recipient to recognize as foreign. This is also why plasma donations can occur between any two individuals, as there is no antigens to be recognized by the recipient's system.

5. One of our case studies talked about blood type and prevalence of COVID as the blood cells discussed line the respiratory tract. The experimental design was flawed; however, the hypothesis has value.

What was the hypothesis? Please discuss the *hypothesis* in this study in terms of cell reception, blood type and COVID. (Make sure you include all **three**) **Underline all of these terms in your explanation in order to get points.

The base hypothesis: That certain blood types would be more susceptible to covid-19.

The results indicated that those with the A blood type had the highest probability of developing Covid-19, where the patients with O type blood had the lowest overall risk.

The question that comes to mind when reviewing this study comes down to whether or not this specific to Covid-19 or if viruses are less drawn to O-Blood types as a rule. Blood type is essentially determined by the type of glycoproteins that are extending from the surface of the cell. Those with an O Blood Type do not have these coming out of their cells, and thus there is nothing for the body's antigens to seek out and target. Thus O type blood is the universal donor. It calls to question whether or not the viruses use these same surface antigens as a means of targeting cells within their hosts?

6. You run the ER department at a small local hospital.

You ask MI Blood to increase blood donations.

- a. Which type of blood is best to give your patients and WHY? Use antibodies and antigens in your explanation to get full points.

The ideal blood type to keep on hand is O, specifically O- blood. As discussed in question 5, O blood lacks surface glycoproteins/antigens. Because of this there is nothing for the recipient's antibodies to target.

B. Which type of blood do you wish your family members had and WHY?

AB+. They are the universal acceptor for blood. This is because their body recognizes the surface antigens (or lack thereof) on the surface of the blood, and their blood also has the Rh protein. Thus their immune system will not target any donor blood under all but the rarest of circumstances.

7. What is the “color” of the blood in the pulmonary artery? WHY? Where does it go next? (be specific, please)

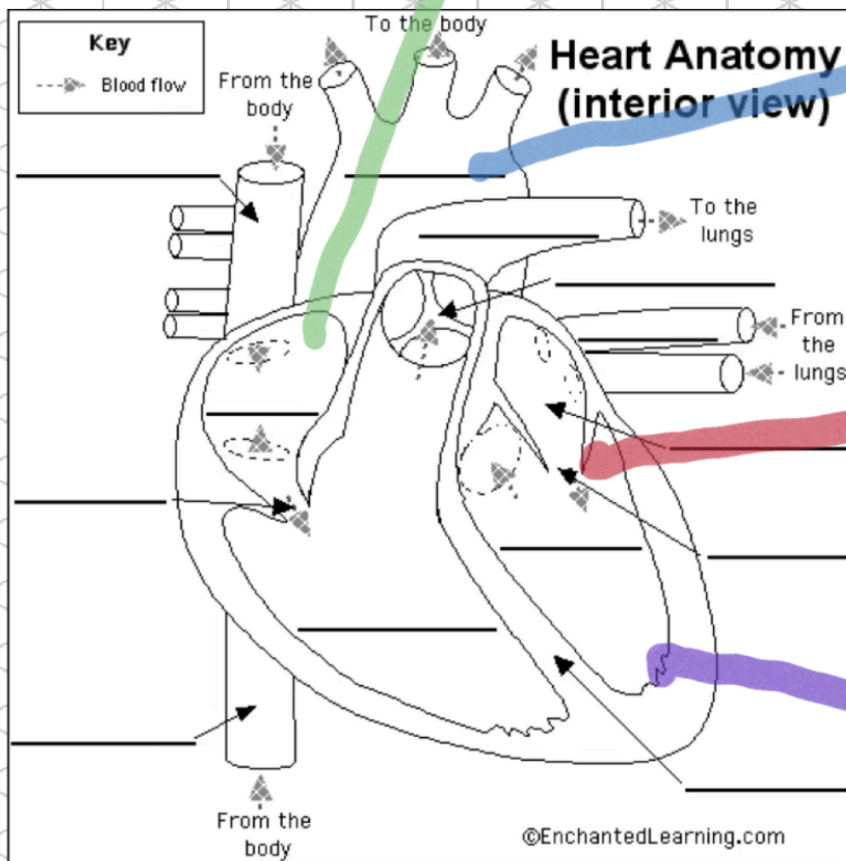
The blood entering the pulmonary artery is still crimson. However, it is darker than the blood that is going to the aorta. This is because of the deoxygenated nature of the blood in question. To use a locally relevant example. If someone has a cut and it's a dark, fresh cherry shade of red, the person has likely taken a venous injury. And while it may require being seen by a medical professional, it is most likely not an emergency. But, if the blood is candy cherry red (like the cherry republic cherry bombs) it is likely an arterial wound, and a medical emergency.

8. What are the valves, in your patient, from right to left, when your patient is laying on a hospital bed?

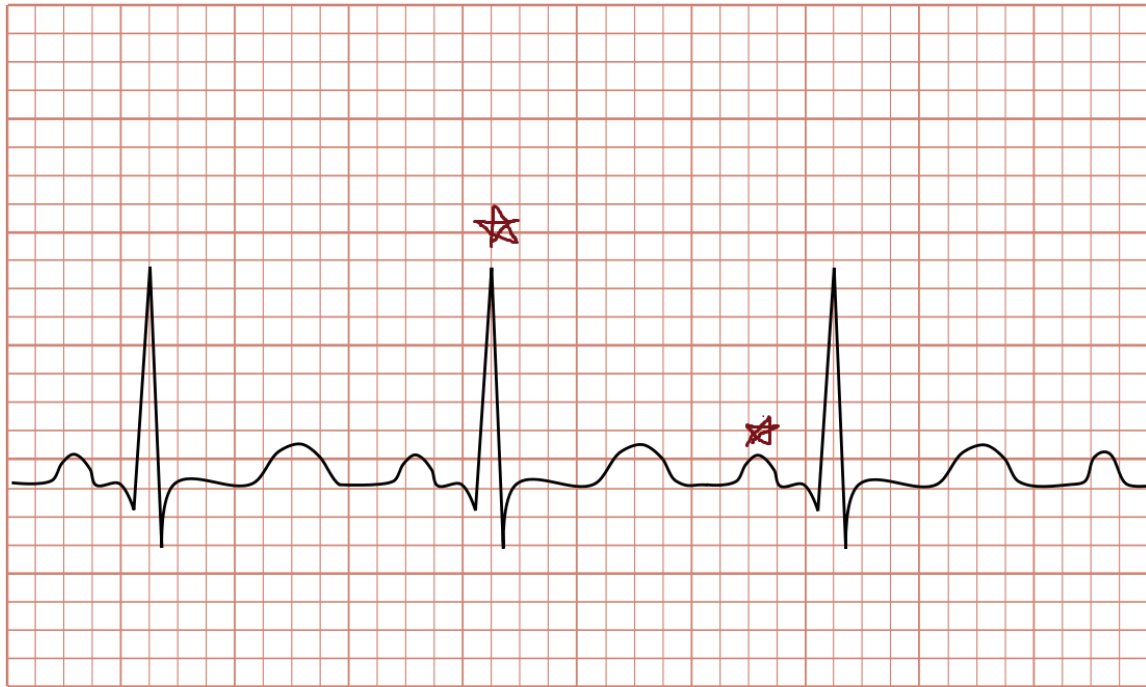
Blood flows in the following (valves boldened, chambers italicized)

Right Atrium -> **Tricuspid Valve** -> *Right Ventricle* -> **Pulmonic Valve** -> *Left Atrium* -> **Mitral Valve** -> *Left Ventricle* -> **Aortic Valve**

9. Using the diagram below, please label (**by using the names, not the letters**) these four things: a.) The chamber that sends blood out to the systemic circulation b.) the chamber that takes blood from the brain and arm c.) the valve known as the mitral valve d.) the chamber that contains our heart's electrical



10. Your patient has an ECG that looks like this: He is pretty smart, as he is in Anatomy and Phys at the local community college. Explain what is happening in his heart at each of the starred locations. You must give an *explanation* and **not a term**.



a. Star #1: The R-Peak of the QRS Complex: This is the point at which the electrical signal conducts through the walls of the ventricles.

b. Star #2: The P Wave: This is where the electrical signal reaches the walls of the Atria, and is symbolically the beginning of the heart beat.

11. Using *venules* and *arterioles*, *aorta*, *vena cava*, please describe HOW blood switches from the *pulmonic* to *systemic* flow. **Underline or highlight all of these terms in your explanation in order to get points.

Like most of anatomy and physiology, blood flow is simple in principle but complex in action. After blood is deoxygenated in the capillaries, it enters the venules, and soon after the veins. Eventually the deoxygenated blood enters the heart through either the inferior or superior Vena Cava, it flows into the Right Atrium. It then travels into the right ventricle, where it is pumped into the pulmonary artery (pulmonic flow). From the pulmonary artery, it travels to the lungs where gas exchange occurs and the blood is oxygenated. This oxygenated blood reaches the left side of the heart at the left atrium, it then flows into the left ventricle and into the body through the Aorta. From there it travels through the body to deliver oxygen to the tissues (systemic flow). This occurs after the blood is distributed to the from the arteries to the arterioles, and from there it travels to the capillaries to deliver the oxygen to the tissues.

12. It is your first day on the job at Munson. You are taking vitals on Phil, a patient who passed out after standing up quickly.

His wife brought him into the ER. His HR is 101. His BP is 142/92. *****

a. What are each of these two numbers *called* (142/92) and what do they tell us? Is this normal?

Top: Systolic

Bottom: Diastolic

Both values are out of the normal range with Phil, but without factoring in the passing out, not alarmingly so. Based off of what I've read, Phil most likely had a case of Orthostatic Hypotension.

B. His heart rate is even higher, now that he was admitted. (He is not a fan of the outfits one wears while in the hospital). However, his blood pressure did NOT rise. Explain WHY, please.

People get nervous when they're in the hospital. It's an uncomfortable and unfamiliar environment where they're mostly naked and very likely about to be prodded and probed with needles and other things.

BONUS: You determine that he is under a lot of stress, juggling a family, two kids, school and two jobs (and COVID). What can you suggest that he do, for free, daily, to lower his heart rate, and reduce symptoms triggered by his Autonomic NS? Keep reading...

Normally I'd say meditate. But he may not think of that as a practical solution. For him I would tell him to try to carve 20-30 minutes out a day for himself. Or to find a calm and relaxing hobby (such as gardening) that he can get his kids to partake in with him.