Directions

So this is your final exam! Unlike previous exams, this one (and the lab practical, also posted) is entirely online. As I've said a few times in class, I **expect and encourage** you to collaborate, and to use every resource at your disposal to answer these questions. Given the nature of this, I am anticipating extremely high grades, as with some time and effort these questions can be easily assessed. The final exam is worth 15 total points, not counting 3 extra credit points. Because the questions themselves are relatively straight-forward, **ten** of the fifteen points will come from your answers, but **five** of your 15 points will come from your contributions on the forum. So make sure you're posting and discussing these answers!

For the following questions, please send me an email with your answers and any necessary attachments. The only limitation is to not plagiarize. So any answer that involves more than just a nerve or structure name needs to be **in your own words**, not directly copied from any source (including fellow students! Don't plagiarize each other!)

For all "what nerve / muscle / etc is damaged" questions, **make sure to include the side (right or left)!** Typically this is straightforward, but sometimes it can be counter-intuitive, so just include it for all of your answers.

Turn this exam in by **emailing me** a Word or other text document with your answers to each question. Make sure your answers are numbered so that they correspond to the appropriate question!

Questions

1. (1 point) *One common symptom of COVID-19 is anosmia, or a loss of the sense of smell. The specific protein that allows SARS-CoV-19 to infect cells is known as ACE2, and we'll discuss ACE2 and it's fellow proteins extensively next semester (they are the targets of ACE-inhibitor drugs). For now, I want you to research what exactly is going on with COVID-19 anosmia.* Please describe (a) what cells are being infected, (b) why infection of those cells causes neurological symptoms (loss of smell), (c) how lasting it is, and (d) what cranial nerve is being impacted.

2. (1 point) *A few years back, I was at a friend's wedding when one of the groomsman (32 year old male) showed up in a panic. His right eye was dry, red, and puffy and he was drooling slightly. He was having trouble speaking clearly and had issues where he was spilling his drinks on himself when he tried to take a sip from a glass. His smile was asymmetrical, but he had no numbness anyway in his face. Luckily, the groom-to-be was a physician, and so there were a large number of people at the wedding who all knew what was wrong with this young man.* (a) What nerve is misbehaving? (b) Where, as precisely as you can identify, is the lesion?

3. (1 point) *You're visiting your grandmother, and notice that her left eyelid is completely closed. You ask for permission and she allows you to open the lid, and you notice her left eye is both depressed and abducted.* What nerve is acting up?

4. (1 point) *A 38-year old man went in for ophthalmic surgery due to a perforation (a wound that penetrates the body into a viscus cavity, here the vitreous cavity) in his right cornea. He seemed to recovery fine after surgery, and was discharged. Six days later, he came to the emergency room with severe, debilitating pain on the right side of his face in response to numerous stimuli (e.g., the wind on his face alone was enough to trigger agony). He had full use of all facial muscles, and all eye exams revealed no difficulty in any motion. Chewing and swallowing functioned, and he salivated appropriately, had fine balance, and no troubles hearing.* What nerve is misbehaving?

5. (1 point) *In one unfortunate soul, an artery on the right side of the brainstem near the cerebellar-pontine angle becomes enlarged. Thus when the patient turns their head to certain angles, or begins to hyperventilate, pressure in this artery increases, causing it to swell and compress a nearby nerve. The patient with this misbehaving artery thus experiences intense bouts of vertigo up to 30 times a day, losing all orientation and sense of balance, often resulting in them falling over.* What nerve is being compressed?

6. (1 point) *A man comes to see you. He reveals that he is a heavy drinker, and has been for*

decades. Lately, he's been having a lot of coordination issues. When he reaches for the remote control for his TV, for instance, he frequently misses, either reaching too far or not far enough to grasp it. He's also been experiencing issues walking, as he frequently loses his balance by missing a step. As he speaks to you, you notice that his words are slurred, although he doesn't seem to have had anything to drink today. What part of his brain is showing signs of damage?

7. (1 point) *A man in his early 60's with a history of liver disease, gastroesophageal reflux, and celiac disease comes to you complaining of a burning pain in his anterior lower neck, but only on his right side, whenever he tried swallowing anything. He has had no fevers, coughs or other typical disease syptoms recently, just this burning pain (rated 10/10 for intolerable) when swallowing. All of his vital signs and lab work came back normal, and scans revealed no tumors or masses anywhere in his head or neck. However, the pain is severe enough that all medications need to be administered intravenously, and a feeding tube is necessary to prevent weight loss until the neuralgia is resolved.* What nerve or nerves are at fault?

8. (1 point) *You're at a bar, and a fight breaks out. An older man is punched, hard, in the left side of his head. A few days later, you run into the man again. He still has a swollen black eye (periorbital hematoma), but also mentions that, although his eye doesn't hurt, he has blurred vision in his left eye. You do a quick assessment of his vision and find that, when he closes his right eye, he can't see things to the left of his left eye.* (a) What hemiretina is damaged? (b) What nerve carries this information back to the brain? (c) Where along the nerve's path is the damage?

9. (1 point) *Due to time constraints and moving online, we did not fully cover the anatomy and physiology of the neck. But luckily, you have access to all of Google, and your anatomy books!* Please research and summarize the **hyoid bone**, the muscles that attach to the hyoid bone, and the nerves that innervate the muscles that attach to the hyoid bone.

10. (1 point) Above is a standard gaze-assessment for a patient, showing the positions of their eyes as they are asked to look in each major direction. This patient has something wrong with them due to a fistula (abnormal connection between to anatomical structures) between the internal carotid artery and a venous structure. (a) What muscle or muscles are failing to properly function? (b) What nerve or nerves are responsible? (remember to include the side!) (c) What venous structure is the carotid inappropriately connected to that would cause this?

Extra Credit

11. (1 point) You meet a new person who is a photic sneezer. They have never had an anatomy class, but are curious why light causes them to sneeze. Please tell me how you would answer their question, again bearing in mind that they will not understand any anatomical jargon you use.

12. (1 point) Your friend remarks to you that the body is an elegant machine, with a crisp, clear, and logical layout. How do you respond?

13. (1 point) Next year, more students will take this class, and I will tell them learn the functional divisions of the nervous system (e.g, visceral/somatic, afferent/efferent) as soon as they can. Please write something here that will help them to do so.