NEUR0010 Exam 2 Review
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You have a lot of multiple choice questions to practice from, but do you truly understand the concepts behind what you're studying? Test yourself here, for starters.

Some of these questions are more food-for-thought **(FFT)** questions than test questions, but they do have reasonable and unreasonable answers.

1. **FFT:** Why do you think it makes more sense to have photoreceptors hyperpolarize to light rather than depolarize?
2. Using a diagram, contrast the two signaling pathways from photoreceptor to an ON or OFF bipolar cell to a retinal ganglion cell. Indicate whether each cell depolarizes or hyperpolarizes, what neurotransmitter is released, the relative amount of it that is released, and what kind of receptors are present on each bipolar cell. Indicate in each pathway whether the retinal ganglion cell increases or decreases its firing rate.
3. You're an ophthalmologist, and you see a patient who has blindness in her upper left visual field. Upon receiving her MRI scan, the radiologist tells you that your patient has a lesion in her upper left optic radiation, which is causing this partial blindness. Do you trust the radiologist's interpretation? If not, where do you think the lesion actually is?
   FFT: How do you think other areas of V1 will compensate for this partial blindness?
4. Commissural tracts are collections of axons that cross over from one hemisphere to another. Perhaps oddly, primary visual cortex (V1) and primary auditory cortex (A1) have very few commissural tracts. In other words, the left V1 doesn't have many connections to the right V1, and the same is true for A1. Why might these regions in particular not "need" so many commissural tracts?
5. Based on what you learned about the action potential, why is it impossible for a single neuron to encode very high frequency sounds using the phase locking principle?
6. If you cut the right half of the spinal cord at level C3, describe what happens to touch and pain sensation below the level of the cut on both sides of the body. What happens to touch and pain sensation above the level of the cut?
7. You are using the tip of your index finger to read a long horizontal sheet of braille so that your finger is continuously receiving mechanosensory input. Based on what you know about the anatomical and physiological properties of the four different mechanoreceptors covered in class, which mechanoreceptor would be able to convey the information from the braille dots most faithfully and accurately? Which mechanoreceptor would be the worst at conveying this information?
8. **FFT:** Diffuse noxious inhibitory control (DNIC) is one mechanism by which the central nervous system, through the caudal medulla, can inhibit pain transmission. In one experiment, researchers pinched one hindpaw of a rat to induce pain, and they recorded from that nociceptor. While that hindpaw was pinched, they submerged the rat's tail in very hot water, and they found that the firing of that initial nociceptor decreased substantially. What do you think is the purpose of having this DNIC system?
9. As you might know from the news, there is a major opioid crisis happening in our country. People are dying from opioid overdose. One of the common drugs people take is fentanyl, which is about 100 times more potent than morphine. Fentanyl heavily stimulates the periaqueductal gray (PAG), specifically the mu receptor. Based on this information alone, would you expect fentanyl to produce powerful analgesia or hyperalgesia?
10. Humans have two major types of motoneurons that innervate different muscle fibers. Our alpha motoneurons innervate extrafusal fibers, and our gamma motoneurons

innervate intrafusal fibers. However, some species have a “beta system,” in which their alpha motoneurons innervate both extrafusal and intrafusal fibers. Why might it be advantageous for humans to have these two separate systems in terms of motor control?

11. In lecture, you learned that the basal ganglia generally has an excitatory output to the cortex to generate movement. The basal ganglia actually projects to the thalamus, which sends the excitatory output to cortex. Lesioning the output nuclei of the basal ganglia results in excessive, uncontrolled movement. Based on this information alone, are the connections from the output nuclei of the basal ganglia to the thalamus excitatory or inhibitory?