

Important instructions:

1. Even if you can't answer a question completely, write down whatever you know about it. Partial credit is better than no credit!
2. For many of the questions, there is more than one correct answer.
3. A thoughtful explanation is worth partial credit even if the answer isn't exactly correct.

Short essay questions (15 points each)

1. (7.5 points) Unlike sodium and potassium which serve very few functions in the nervous system, calcium is important in a large number of neural functions. Name and briefly explain four of the functions that calcium serves in neural and synaptic function

2. (7.5 points) How is it possible for a receptor that depolarizes the membrane to be inhibitory?

3. (7.5 points) Describe three functional “themes” that are common to both vision and auditory processing.

4. (7.5 points) Explain three ways that dendrites contribute to information processing in the nervous system.

Long essay questions (15 points each)

5. (15 points) Describe, compare, and contrast the cellular and molecular mechanisms of short term memory for nonassociative sensitization in *Aplysia*'s gill-withdrawal reflex and the short term memory encoded by long-term potentiation in the hippocampus.

6. (15 points) Explain the visual processing pathways from the photoreceptors to the primary visual cortex. What happens to visual information at each of these steps: photoreceptors, bipolar cells, retinal ganglion cells, lateral geniculate nucleus, superior colliculus, and primary visual cortex (V1).