

**Short essay questions (7.5 points each) - there will be four of these.**

1. (7.5 points) What role do the neural properties of dynamic range and spike frequency adaptation play in the encoding of color in the visual system?

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

3. (7.5 points) How is light transduced into action potentials in the retina?

4. (7.5 points) Explain the features of NMDA receptors that make them effective receptors for governing synaptic plasticity.

**Long essay questions (15 points each)**

5. Describe, compare, and contrast the cellular and molecular mechanisms of LONG-term memory for nonassociative sensitization in *Aplysia*'s gill-withdrawal reflex and the LONG-term memory encoded by LATE 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).