Neuroscience BIO-311

Exercises

Vision – the retina

1) Name two types of photoreceptors. What are their primary roles in vision? What do they look like, and where are they found? How are they different from ChannelRhodopsins?

2) Explain the process of primary sensory transduction (conversion of the adequate physical stimulus [here: photons] into an electrical membrane signal in the photoreceptor cell), and where this takes place.

3) Draw the receptive field of an ON-ganglion cell in the retina. Remember how a "receptive field" of a sensory neuron in the somatosensory system looks like (Unit 4). Now state the general definition of "receptive field of a sensory neuron".

4) Name 5 basic classes of neurons in the retina. Which type of neurons in the retina is capable of firing an action potential?

5) Explain the difference between an ON- and an OFF-bipolar cell. Why does the ON bipolar cell depolarize with light, whereas the OFF bipolar cell hyperpolarizes with light?

6) Explain in a drawing how the retinal circuit (ON- and OFF- system with horizontal cells) enhances contrast.

7) Based on what you have learned about the retina, propose a mechanism through which the visual system can detect the edge of an object. You can make a drawing.