- All sensory receptors are neurons: true or false? Explain your answer.
    - False. They can be:
        - Specialized neurons that can receive a stimulus and create an action potential
        - Sensory cells that receive a stimulus and release neurotransmitters that activate an afferent neuron
- In order to convey information about the outside world to the brain, a sensory system must convert some external _____ into a _____ signal.
- The two kinds of electrosensory system are _____, used by sharks, and _____, used by weakly electric elephant nosed fish.
- Why do all animals immersed in water generate electrical signals? What is it about their physiology that creates this electrical field?
    - The field comes from ion flow during muscle contractions and ions pumping in or out of the gills
- What kind of signal does the shark detect (be much more specific than just “an electrical signal”)? What type of sensory receptor does this use? What is the general structure of this receptor?
    - Detects electrical currents produced by other organisms in the surrounding water.
    - Uses an ampullary receptor, the Ampullae of Lorenzini; jelly-filled canals that detect changes in electrical potential.
- Why can sharks find live prey buried in the sand? Why can they find dead prey hidden under an agar chamber?
    - First example is electrosensation, second is chemosensation.
- What kind of signal does the weakly electric elephantnose fish detect (again be specific)? What receptor type do they use? What are the two subtypes of this form of electrosensation? What aspects of this signal do organisms who use this type of electroreception pay attention to to build a map of their surroundings?
    - Detect the return of electrical impulses that they themselves produce
    - Using a tuberous receptor
    - Two types are:
        - Wave form: amplitude
        - Spike form: amplitude, interval and latency
- Two kinds of mechanosensory receptor channels were mentioned in class. Name them, and describe how one of them works.
    - Piezo proteins encoded by piezo genes
    - Transient receptor potential channels (TRP channels)
        - Mechanical force triggers a force sensor, which causes second messenger release, which leads to the TRPV1 channel opening
- Receptor cells can respond in two different ways to prolonged stimuli: _____ responses, aka _____ adapting, and _____ responses, aka _____ adapting. Define each response, mentioning how the amount of receptor firing changes over time.
    - There are tonic and phasic responses:

        - Tonic/slow adapting: constant firing for the duration of a stimulus.
        - Phasic/fast adapting: firing only when the stimulus begins and when it changes intensity, including when it ends.
- How do mechanosensory systems encode information about the intensity of a stimulus? (Hint: explain frequency coding).
    - Intensity is coded as the frequency at which action potentials are fired
    - More intensity = more firing, starting at a threshold and going to a saturation point
- What does it mean if a stimulus is “below the threshold”? If it is “within the dynamic range”? What does it mean if the receptor has “reached saturation”?
    - Below threshold: stimulus is too mild to cause receptor firing and will not be detached
    - Within dynamic range: within the range of intensities where the receptor is able to register changes in intensity
    - Reached saturation: further increases in stimulus intensity will not be detected; the receptor has maxed out.
- How many orders of mechanosensory processing are there? Diagram them as a signal moves through the body.
    - Four
- Do signals travel at the same time through the same interneuron or in parallel in different interneurons? Why is this important?
    - In parallel
    - Because it lets the brain interpret information from multiple different neurons to understand a stimulus
- Define a receptive field. Where in the receptive field would a stimulus need to occur to cause the greatest receptor firing? The least? Do receptive fields overlap? Explain how these concepts allow the brain to localize where a stimulus has occurred.
    - Receptive field: area of the skin innervated by a single mechanoreceptor
    - Strongest firing if the stimulus is in the center, weakest if it’s at the edge
    - Yes they overlap
        - This allows responses from neighboring neurons to contribute to narrowing the location of a stimulus
- Define and explain the process of lateral inhibition. Why is it important for spatial processing? Which orders of processing does it occur at? What special interneurons are involved, and what do they do?
    - The most strongly firing neuron inhibits firing of neighbors
    - This allows really specific pinpointing of stimulus location
    - First and second
    - Inhibitory interneurons, which cause the neighboring neurons to be inhibited by the strong firing of the central neuron
- What are the two kinds of human skin?

- You should be able to name six kinds of mechanoreceptors, the stimulus they respond to, and the type of response (phasic/tonic) that they produce.