

Swimmy

Standard Student Pre-/Post-Test

1. I am a UCLA student?

- a. Yes
- b. No

UCLA Student ID Number

--OR--

Non-UCLA Student Institution Name: _____

2. Email Address: _____

(This will be used for tracking purposes and possibly to send you a reminder to do the Post-Test only. We will keep your email address confidential, and we will not share it with anyone.)

3. Academic year:

- a. Freshman
- b. Sophomore
- c. Junior
- d. Senior
- e. Other

4. Department/major in which the course was offered:

- a. Psychology department/major
- b. Biology department/major
- c. Neuroscience department/major
- d. Other

5. Department/major to which I belong: _____

6. Grade expected to receive in the course:

- a. A
- b. B
- c. C
- d. D
- e. F

7. Gender

- a. M
- b. F

8. I would characterize myself as:

- a. Asian
- b. Black
- c. Latino(a)
- d. Native American
- e. White
- f. Other

9. Action potentials are crucially due to:

- a. sodium ions moving into the neuron.
- b. potassium ions moving into the neuron.
- c. calcium ions moving into the neuron.
- d. potassium ions leaving the neuron.
- e. chloride ions leaving the neuron.

10. The crucial event needed for the initiation of an action potential is:

- a. release from inhibition.
- b. entry of calcium ions through NMDA channels.
- c. entry of sufficient sodium ions to bring the membrane potential to zero.
- d. entry of sufficient positive charge to depolarize the membrane by a certain critical amount.
- e. entry of sufficient potassium ions so that there is more positive than negative charge inside the cell.

For Question 11, refer to Figure 1 below.

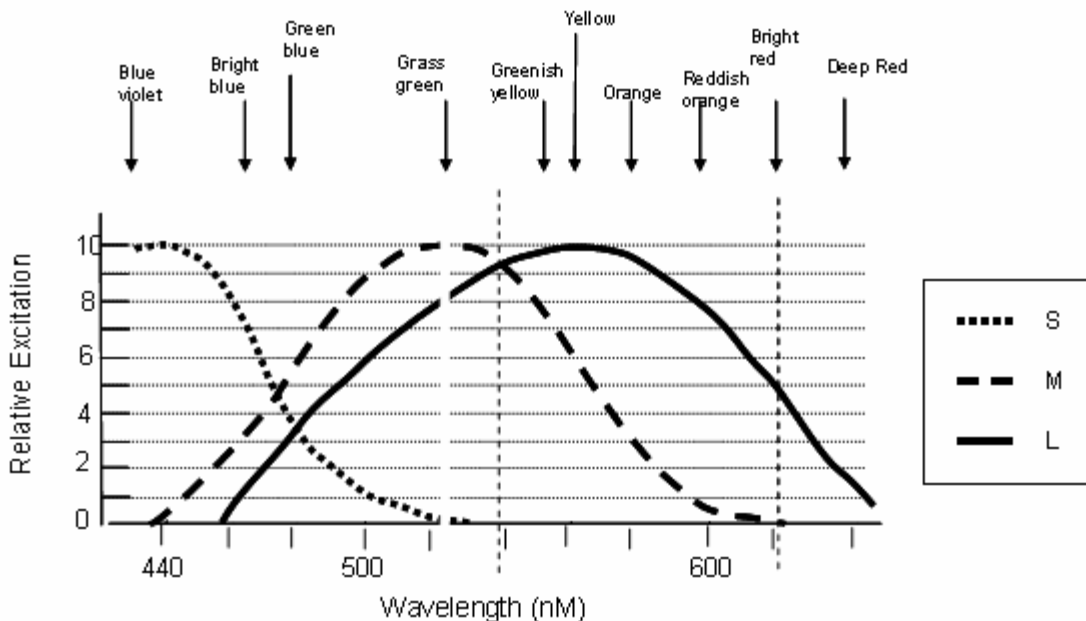


FIGURE 1: Our retinas have three sorts of color receptors: short (S), medium (M) and long (L). Each of these receptor types has a different profile of activation as a function of the wavelength of light as shown in the above figure. The colors we see are the responses of our brain to the relative amounts of activation of the S, M, and L receptors. Thus, as indicated in the above picture, we perceive green when there is more M than L activation and very little S, while we see violet when there is lots of S and very little M or L.

11. These facts result in some rather surprising effects of mixing wavelengths of light. According to the above figure, what color would we perceive if we mixed a greenish-yellow light of 540 nm with a bright red light of 620 nm that is 4 times brighter than the greenish-yellow light?

- a. blue violet
- b. greenish blue
- c. yellow
- d. orange
- e. bright red

For Questions 12 and 13, refer to Figure 2 below.

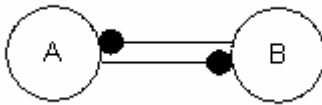


FIGURE 2: Cell A and Cell B are intrinsically tonically active when not receiving input from each other. The synapses shown are inhibitory ones that have no plastic properties (i.e. they don't get either stronger or weaker over time or with use). When active, they prevent their target from firing.

12. Suppose that one hyperpolarizes Cell B enough to prevent it from firing for a while and then turns off the hyperpolarization. Thereafter:

- a. neither cell will fire.
- b. Cell A will fire continuously and Cell B will not fire at all.
- c. Cell B will fire continuously and Cell A will not fire at all.
- d. both cells will fire continuously.
- e. one of the two cells will fire continuously.

13. In the above circuit, suppose one hyperpolarizes both A and B so as to stop them both for a while. Thereafter (choose the most likely answer):

- a. neither cell will fire.
- b. Cell A will fire continuously and Cell B will not fire at all.
- c. Cell B will fire continuously and Cell A will not fire at all.
- d. both cells will fire continuously.
- e. one of the two cells will fire continuously.

For Question 14, refer to Figure 3 below.

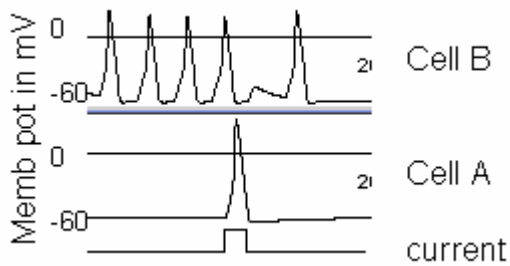


FIGURE 3

14. Suppose a student, Jocko, thought that Cell A inhibited Cell B. He already knows that Cell B fires continuously because it is receiving excitatory input from some other neurons. In order to test his conjecture, Jocko passed a depolarizing current into Cell A with the intention of making it spike. In his lab report he provides the picture shown in **Figure 3**. A spike occurs in Cell A during the time he was depolarizing it, and Cell B fails to spike in response to an EPSP that occurs shortly after the spike in Cell A. What sort of mark should the instructor give Jocko for this part of his lab report?

- The experiment should receive full credit.
- No credit should be given because inhibition produced in Cell B by the spike in Cell A could not possibly occur soon enough to prevent Cell B from firing.
- Less than full credit should be given because there is no control data to show what would have happened if the current pulse had not been applied.
- Less than full credit should be given because there is no control in which it is shown that hyperpolarizing Cell B can prevent EPSPs from producing spikes.
- No credit should be given because the depolarizing current has no effect on Cell A.

15. Suppose that you are recording intracellularly. You find several action potentials occurring near each other in time. The first of these action potentials is always slightly larger than the others. What you are observing:

- isn't possible because action potentials are always all-or-none
- shows that you are recording from several different neurons, some being closer to the recording electrode than others.
- happens because the action potentials occurring after the first occur in the relative refractory period.
- isn't possible because the refractory period of the axon will prevent this from occurring.
- both *a* and *d*

For Questions 16, refer to Figure 4 below.

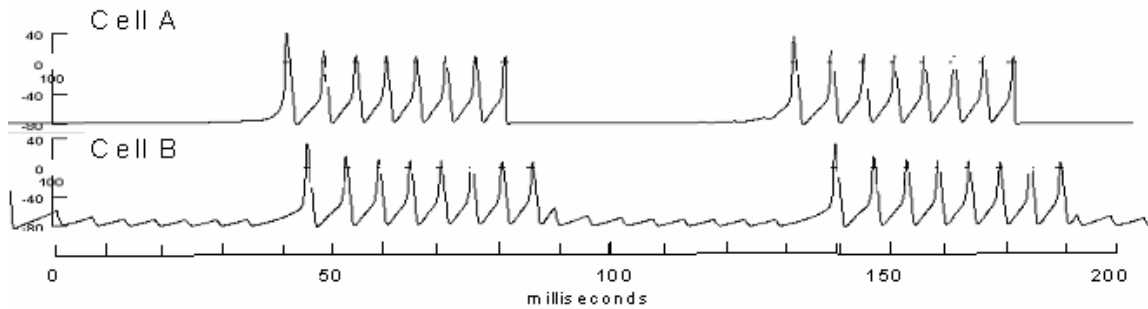


FIGURE 4

16. The tall, upward deflections are probably:

- EPSPs.
- IPSPs.
- action potentials.
- membrane potentials.
- further information is needed to make a reasonably informed guess

17. In the first year of research, Dr. Rana finds frogs with gross deformities in a single pond in Minnesota. In the second year, these deformities are found throughout Minnesota. In the third year, these deformities are now found throughout the upper Midwest including Minnesota and southern Canada. Dr. Rana considers pesticides, global warming, viruses, water pollution, and inadequate past observations as possible reasons. Which of the following BEST explains the pattern of results that she has found across three years?

- pesticides
- global warming
- contagious disease
- water pollution
- inadequate past observations

18. Suppose one was to increase the concentration of sodium ions bathing a neuron to above normal (using a salt whose negative ion was not membrane-permeable). How would the amplitude of an intracellularly recorded action potential be affected?

- No action potential could be produced.
- The action potential would be smaller.
- The action potential would be the same as normal.
- The action potential would be larger than normal.
- The action potential would be inverted (hyperpolarizing).

19. Inhibition:

- detracts from excitation through a straightforward algebraic summation.
- is probably due to the influx of sodium ions.
- detracts from excitation through summation that can only be described by a complex polynomial.

- d. detracts from excitation both through a straightforward process of summation and by causing a shunting of current.
- e. is probably due to the efflux of chloride ions from the cell.

20. Professor Hairless has found that bald men have much higher levels of a chemical compound he calls factor B in their blood than men with lots of hair, and he believes that this is why they go bald. Baldness is of course hereditary, but he thinks that the genetic makeup of individuals who have baldness-promoting genes work by altering the metabolism of factor B. He has also found that drinking lots of carrot juice substantially increases the concentration of factor B, whereas eating lots of spinach decreases it. He thinks he can cure baldness by putting bald men on a high spinach diet, and he proposes a big clinical trial to test that. Suppose that he does this study and finds no effect. What can be concluded?

- a. His ideas about spinach must have been wrong.
- b. He still should do a study to find out whether carrot juice causes hair loss in non-bald men in order to prove his point.
- c. The reduction in factor B caused by the spinach diet were insufficient to produce an effect.
- d. Baldness-producing genes probably do not produce baldness by elevating factor B.
- e. *c* or *d*

21. Synaptic depression:

- a. is synonymous with inhibition.
- b. occurs when a presynaptic terminal releases inhibitory neurotransmitter onto a postsynaptic membrane.
- c. occurs when an IPSP is generated in a postsynaptic cell.
- d. occurs when a synapse becomes less effective through repeated activations.
- e. *a*, *b*, and *c*

For Question 22, refer to Figure 5 below.

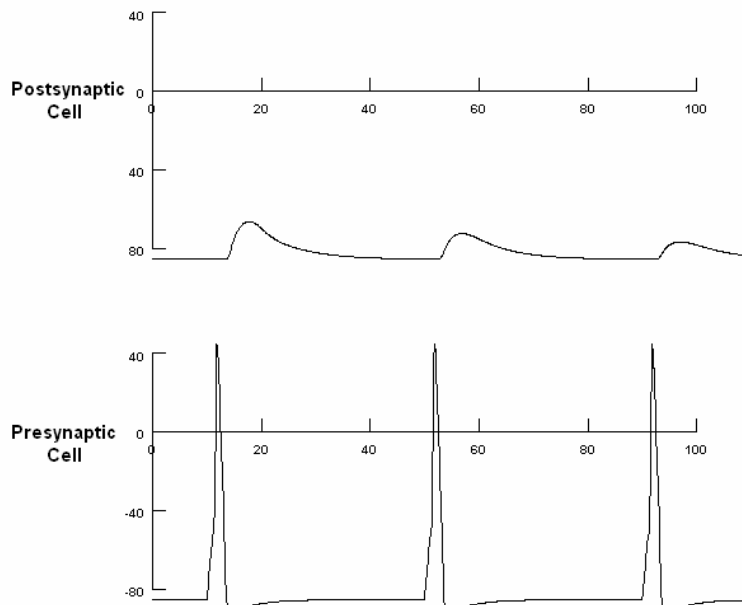


FIGURE 5: The bottom (presynaptic) cell makes a direct excitatory connection to the top (postsynaptic) cell.

22. The decline in responses of the top (postsynaptic) cell in **Figure 5** is most likely a result of:

- a. the presynaptic cell becoming refractory.
- b. the postsynaptic cell becoming refractory.
- c. the synapses between the cells are becoming less effective.
- d. the presynaptic cell is inhibiting the postsynaptic cell.
- e. the presynaptic cell is being depleted of potassium ions.

23. Dale's Law states:

- a. action potentials are all-or-none.
- b. a neuron's ability to fire sequentially is limited by the absolute refractory period.
- c. a neuron's ability to fire sequentially is limited by the relative refractory period.
- d. sodium pours in during an action potential and potassium exits.
- e. a given neuron releases the same type of neurotransmitter at each terminal.

24. Which of the following is the best definition of a reversal potential?

- a. It is the potential at which the action potential "reverses" and starts to come back down.
- b. It is the potential at which there is no net movement of ions, no voltage change, and no current.
- c. It is the afterpolarization, which is the reverse of the action potential.
- d. It is the change in membrane potential caused by an inhibitory neurotransmitter, which is the reverse of an EPSP.
- e. It is the net potential that one sees when combining an EPSP with its reverse, which is an IPSP.

25. If taking the Pre-Test, write the word **PRE**

--OR--

If taking the Post-Test, write the number of weeks it has been since completing the Swimmy module:
