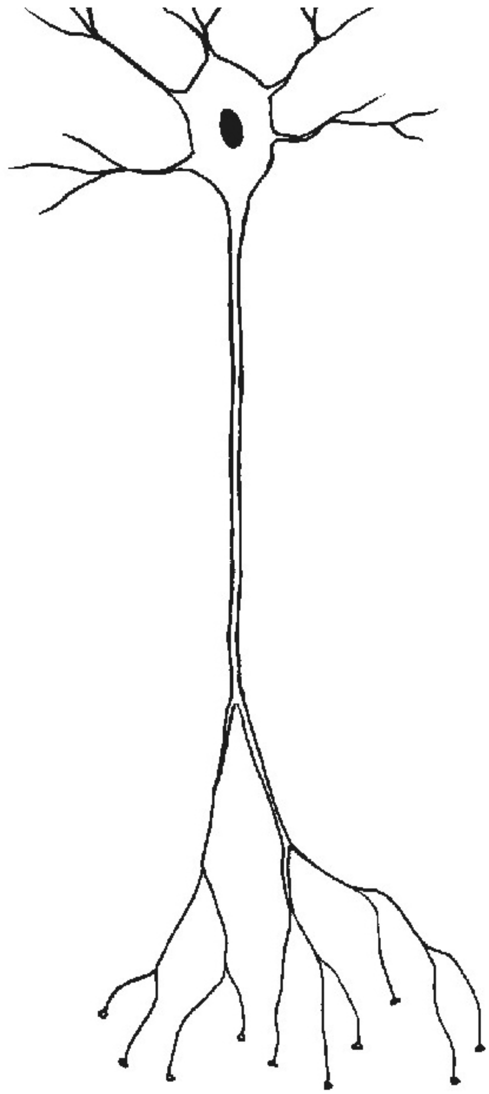
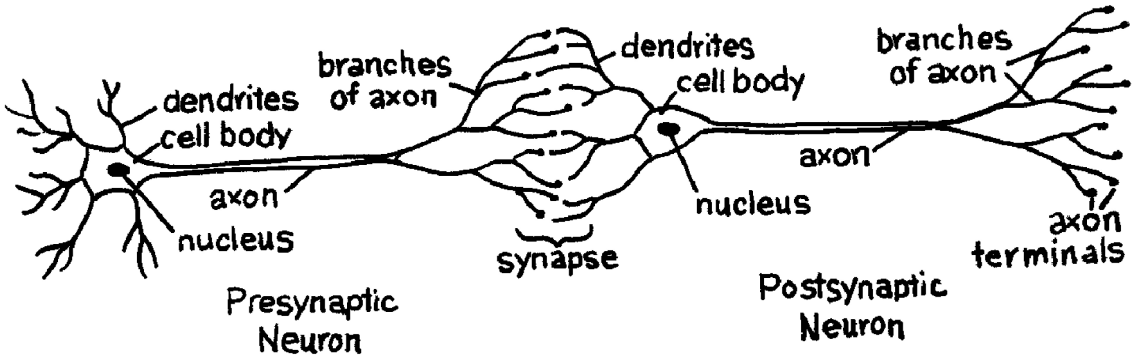
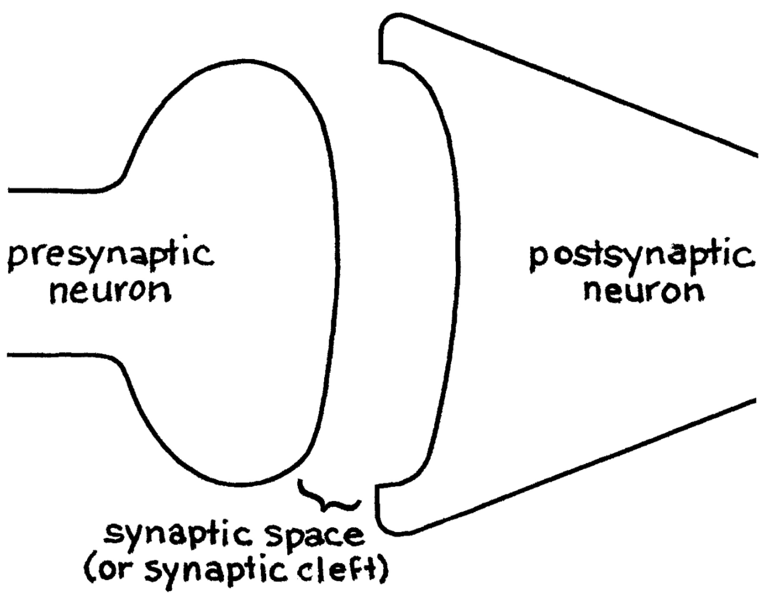
Anatomy of a Neuron



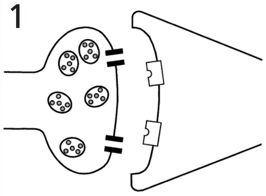
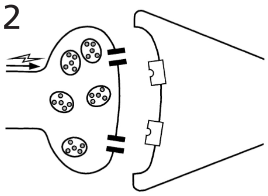
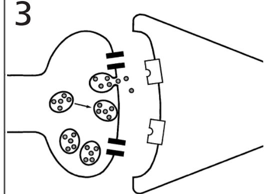
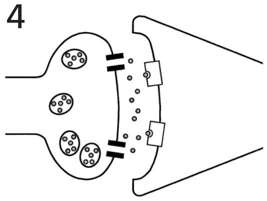
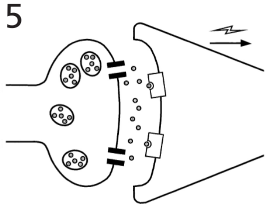
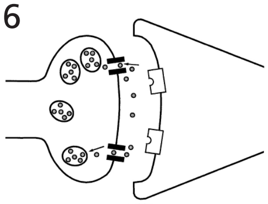
Neurons Interact with Other Neurons through Synapses





How Do Neurons Communicate?

Name(s)____ Date_______________

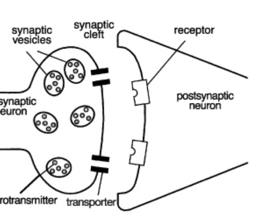
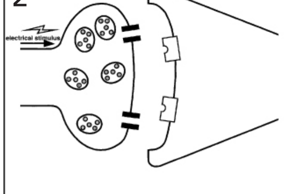
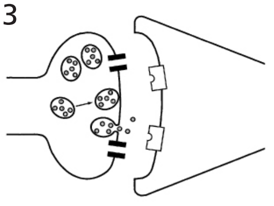
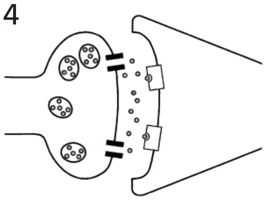
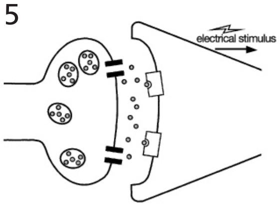
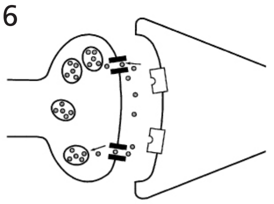
1 	
2 	
3 	
4 	
5 	
6 	

Neurons Communicate by Neurotransmission

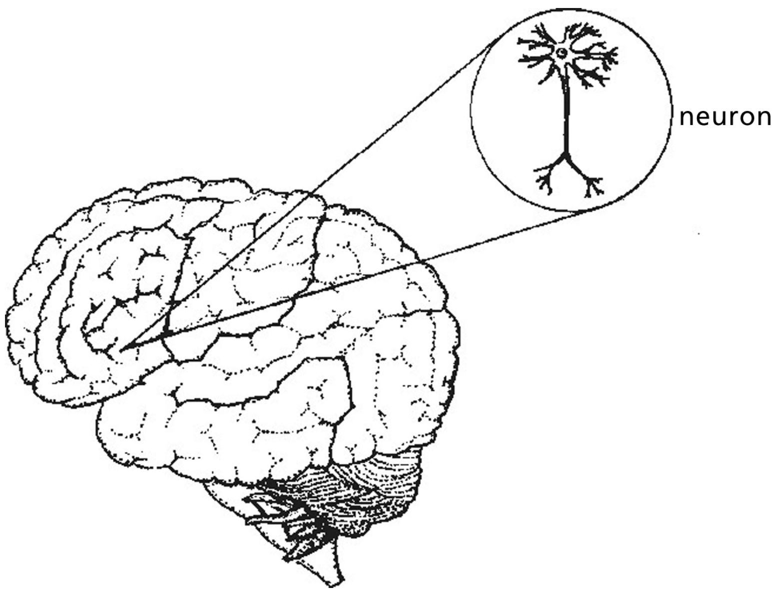
Neurons communicate using both electrical signals and chemical messages. Information in the form of an electrical impulse is carried away from the neuron's cell body along the axon of a presynaptic neuron toward the axon terminals. When the electrical signal reaches the terminal, it cannot cross the synaptic space, or synaptic cleft, to reach the postsynaptic neuron. Instead, that electrical signal triggers chemical changes that can cross the synapse and affect the postsynaptic cell. When the electrical impulse reaches the presynaptic axon terminal, it causes membranous sacs, called vesicles, to move toward the membrane of the axon terminal. When the vesicles reach the membrane, they fuse with the membrane and release their contents into the synaptic space. The molecules contained in the vesicles are chemical compounds called neurotransmitters. Each vesicle contains many molecules of a neurotransmitter. The released neurotransmitter molecules drift across the synaptic cleft and then bind to special proteins, called receptors, on the postsynaptic neuron. A neurotransmitter molecule will bind only to a specific kind of receptor. The binding of neurotransmitter to its receptor causes a change in the postsynaptic neuron that in turn causes that neuron to generate an electrical impulse. The electrical impulse then moves away from the neuron ending toward the cell body of the receiving neuron. After the neurotransmitter binds to the receptor and transmits the signal to the postsynaptic neuron, it comes off, or releases from, the receptor into the synaptic space. Specific proteins called transporters or reuptake pumps carry the neurotransmitter back into the presynaptic neuron. When the neurotransmitter molecules are back in the presynaptic axon terminal, they can be repackaged into vesicles for release the next time an electrical impulse reaches the axon terminal. Enzymes present in the synaptic space degrade neurotransmitter molecules that are not taken back up into the presynaptic neuron.

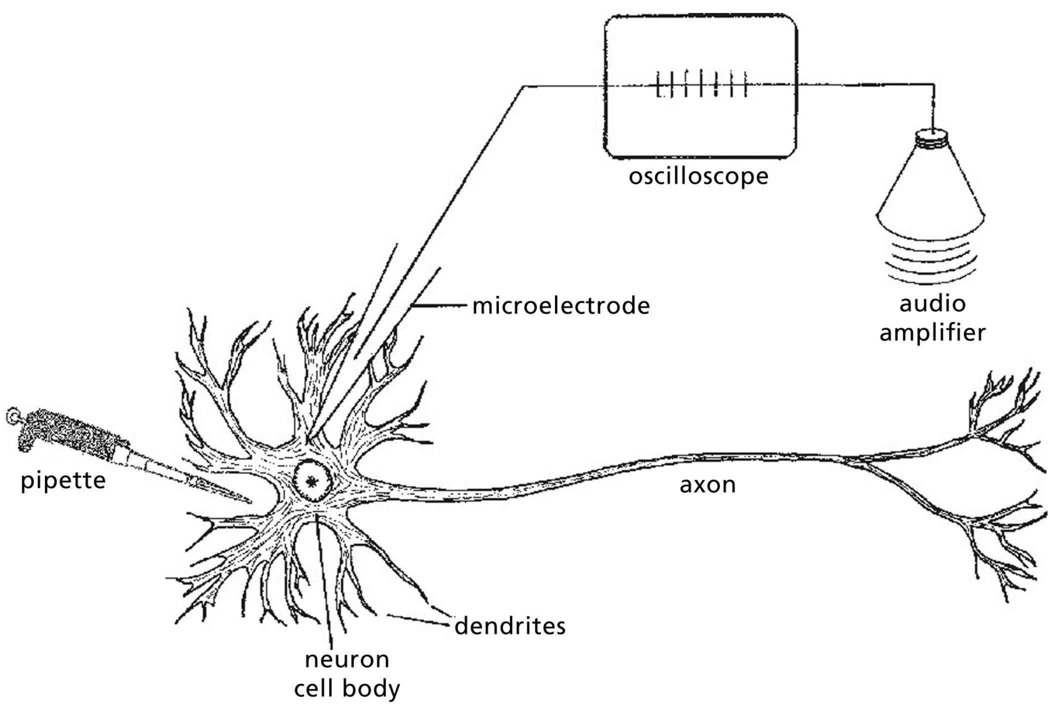
Neurotransmission

Name(s)______________________________ Date__________

1 	
2 	
3 	
4 	
5 	
6 	

Recording the Activity of a Neuron

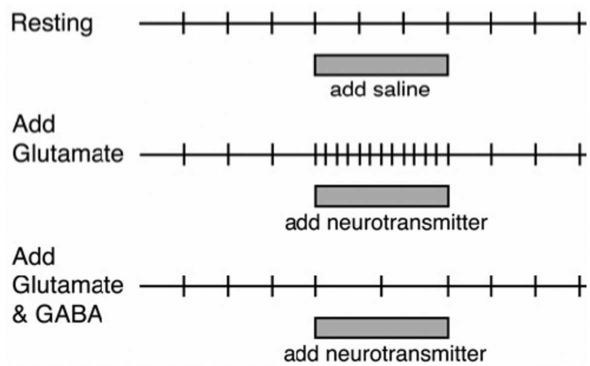




Neurotransmitter Actions

Name(s)____ Date____________

The following diagrams represent recordings of the electrical activity of a neuron over a period of time. Each vertical line on the diagram represents an electrical impulse, or action potential, occurring in the neuron. The first diagram represents a neuron at rest. For the other recordings, a solution containing neurotransmitter was applied to the neuron.



1. **Why is saline applied to the resting neuron?**

2. **When the neurotransmitter glutamate is applied to the neuron, how does its activity change?**

3. **How does the application of the two neurotransmitters, glutamate and GABA, change the activity of the neuron?**

4. **Predict how the activity of the neuron would change if only GABA was applied to the neuron.**

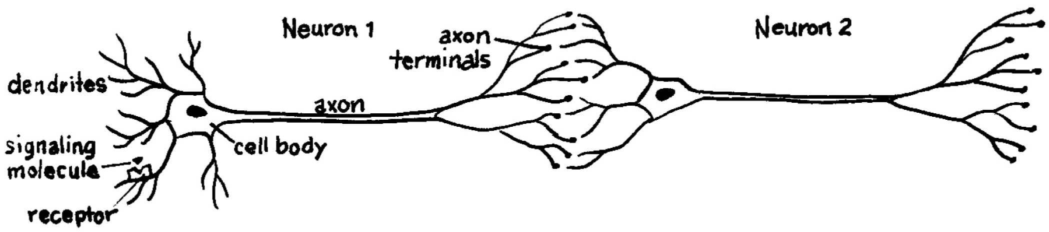
5. **Do all neurotransmitters affect a neuron in the same way?**

6. **How would the application of glutamate to a neuron change the amount of neurotransmitter released from that neuron? How would the application of GABA to a neuron change the amount of neurotransmitter released from that neuron?**

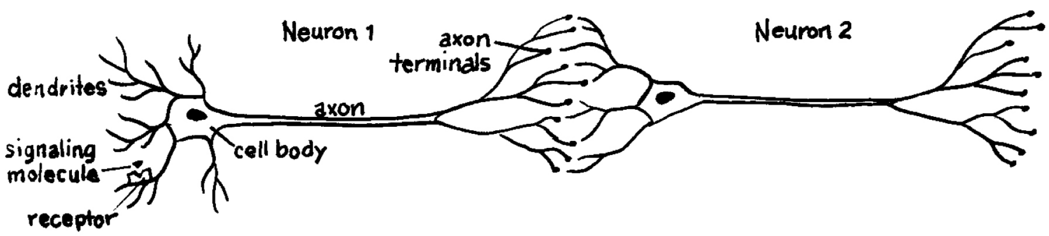
Neurons in Series

Name(s)________________________________ Date__________

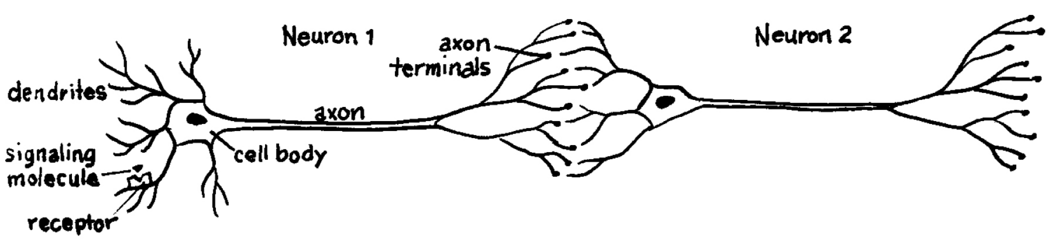
Using what you have learned about the effects of the neurotransmitters glutamate and GABA, determine how the different signals that affect Neuron #1 can change the release of the neurotransmitter dopamine from Neuron #2. Use the chart to help you work through the cases. You can use a down arrow to indicate a decrease or an up arrow to indicate an increase.



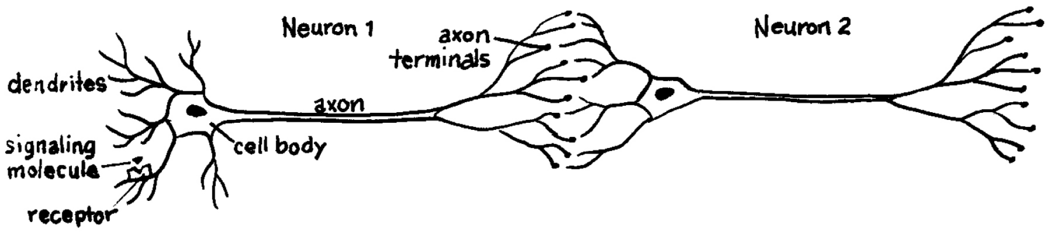
A. **The signaling molecule is inhibitory. Neuron #1 releases glutamate as its neurotransmitter. Neuron #2 releases dopamine as its neurotransmitter.**



B. **The signaling molecule is excitatory. Neuron #1 releases glutamate as its neurotransmitter. Neuron #2 releases dopamine as its neurotransmitter.**



C. **The signaling molecule is inhibitory. Neuron #1 releases GABA as its neurotransmitter. Neuron #2 releases dopamine as its neurotransmitter.**



D. The signaling molecule is excitatory. Neuron #1 releases GABA as its neurotransmitter. Neuron #2 releases dopamine as its neurotransmitter.

Case	Does the signal molecule excite or inhibit Neuron #1?	Does the activity of Neuron #1 increase or decrease?	Does the amount of neuro-transmitter released from Neuron #1 increase or decrease?	What is the name of the neuro-transmitter released from Neuron #1?	Is the neuro-transmitter released from Neuron #1 excitatory or inhibitory?	Does the activity of Neuron #2 increase or decrease?	Does the amount of dopamine released from Neuron #2 increase or decrease?
A							
B							
C							
D							