

BIO 25 PAL Worksheet  
Week 6 (#1): Neurotransmitters

**Remember**

1. Arrange the events that occur during synaptic transmission (listed below) in the correct sequence:
  - (1) An action potential is propagated along a presynaptic neuron
  - (2) Neurotransmitter binds with receptors on the postsynaptic membrane
  - (3) Neurotransmitter diffuses across the synaptic cleft
  - (4) Neurotransmitter is released from the presynaptic neuron
  - (5) An increase in the permeability of the presynaptic neuron to  $\text{Ca}^{2+}$
  - (6) The postsynaptic membrane permeability to  $\text{Na}^+$  ions increases
  - (7) Acetylcholinesterase degrades acetylcholine
2. Is the synaptic transmission described above excitatory or inhibitory? How do you know?

**Understand**

3. Neuron A, Neuron B and Neuron C are all presynaptic to Neuron F. If A and B fire, F fires. If A and C fire, nothing happens. Draw this situation below. What can you conclude about the synapse between C and F? Between A and F? What other information might you need?
4. Neuron J, Neuron K, and Neuron L are all presynaptic to Neuron T. J and K both cause EPSPs of +5 on T, whereas L causes an IPSP of -7 on T. Assume that T has a resting potential of -72 and threshold is at -65.
  - A) Describe how temporal summation could result in an action potential on T.
  - B) Describe how spatial summation could result in an action potential on T.

**Apply**

5. The following poisons/toxins affect the synapse between the motor neuron and skeletal muscle, a synapse that is always excitatory, and uses the neurotransmitter acetylcholine (ACh). For each of these poisons/toxins, predict the effect on the "victim" (what symptoms might you observe, could this cause death, and if so, how?) and how this effect develops.
  - A. Black widow spider venom: explosive release of ACh from the presynaptic neuron
  - B. *Clostridium botulinum* toxin: blocks release of ACh from presynaptic neuron.
  - C. Curare: (reversibly) blocks ACh receptor sites on the skeletal muscle membrane.
  - D. Military nerve gas: irreversibly inhibits acetylcholinesterase