

**BIO 131 PAL**  
**Week 4 – Problem Set 1**

**EQUILIBRIUM POTENTIALS, MEMBRANE POTENTIALS, ACTION POTENTIALS**

1. Define equilibrium potential, membrane potential, action potential.
  
2. A new drug has been found to shift the threshold voltage of gated channels in axons to a more positive value (for example -40 rather than -55 mV). Which of the following is **TRUE**? Administration of this drug could:
  - A. Make neurons hyperexcitable
  - B. Move the neuronal resting membrane potential closer to threshold
  - C. Require a larger suprathreshold graded potential in neurons to initiate an action potential
  - D. Make it more likely that there is contracted muscle paralysis

Justify your answer.

3. Draw an action potential for a neuron.  
The graph shows the state of the Na<sup>+</sup> channel and K<sup>+</sup> channel during the course of the action potential. Also indicate when the absolute and relative refractory periods occur.



4. Differentiate between continuous and saltatory conduction.  
Which of the two do you think has higher energy needs? Why?

5. Which of the following would induce flaccid muscle paralysis?

Circle all that apply:

- Blocking V-gated  $\text{Ca}^{++}$  channels on the axon terminal of somatic motor neurons
- Preventing the inactivation gate from closing for V-gated  $\text{Na}^+$  channels
- Increasing the activity of the enzyme acetylcholine esterase
- Adding a acetylcholine receptor antagonist to the synaptic cleft

6. Predict the sign (+ or -) of the equilibrium potential for the hypothetical ion  $\text{M}^-$ , knowing that  $\text{M}^-$  is highly concentrated in the ECF.

\*\*\*\* Add Synapses Questiond

Add question about something not working, maintain a neuron alive in a dish would it release NT's

Totrototoxin

Special Summation and/or temporal summation

Synapses and neural integration

## **NERVOUS SYSTEM**

1. Make a concept map using the following terms to differentiate between the sympathetic and parasympathetic nervous system:  
Sympathetic neuron, parasympathetic neuron, one-neuron pathway, two neuron pathway, long postganglionic neuron, short postganglionic neuron, acetylcholine released onto target cell, norepinephrine released onto target cell, alpha and beta adrenergic receptor on target cell, muscarinic cholinergic receptor on target cell, fight and flight, rest and digest