

4. Threshold stimulus intensity – stimulus intensity that is just sufficient to produce an action potential
 - a. 15 mV depolarization triggers an action potential
 - b. Many voltage-dependent Na⁺ channels open at -55mV depolarization
 - c. Na⁺ flows rapidly into the cell, propelled by the high extracellular Na⁺ concentration and attracted by the negative electrical charge inside membrane
 - d. K⁺ leaves cell repelled by the positive electrical charge inside the membrane when K⁺ channels open
 - e. Hyperpolarization – the membrane becomes temporarily more polarized than when at rest with K⁺ movement
- I. Refractory – channels become inactivated immediately after opening for an action potential and require a specific amount of time before they can be activated again for a subsequent action potential
 1. Absolute refractory period
 - a. The membrane is unresponsive to stimuli
 - b. Na⁺ channels cannot reopen for a specific period of time following their closure
 2. Relative refractory period
 - a. Occurs during the latter part of the action potential
 - b. Membrane potential is returning toward its resting level and may be hyperpolarized
 - c. A stimulus must be stronger than normal to activate Na⁺ channels
- J. Propagation of action potentials
 1. After being generated, the change in electrical potential spreads passively along the axon to the adjacent region of the membrane
 2. Impulse is propagated by flipping of the polarity of the electrical signal
 3. When depolarization of the adjacent reaches threshold, another action potential is generated
 4. The spread of depolarization is repeated along the length of the axon
 5. Propagation of an action potential is dependent on both passive properties of the axon and active opening of ion channels distributed along the length of the axon
 6. Structural adaptations that improve passive properties of faster-conduction axons
 - a. Increased diameter of the axon
 - i. A larger-diameter axon will allow greater current flow
 - ii. Allows less time required to change electrical charges of the adjacent membrane