# MSS - PHYSIOLOGY_Questions

During the upstroke of the nerve action potential
(A) there is net outward current and the cell interior becomes more negative
(B) there is net outward current and the cell interior becomes less negative
(C) there is net inward current and the cell interior becomes more negative
(D) there is net inward current and the cell interior becomes less negative

In contraction of gastrointestinal smooth muscle, which of the following events occurs after binding of Ca2+ to calmodulin?
(A) Depolarization of the sarcolemmal membrane
(B) Ca2+-induced Ca2+ release
(C) Increased myosin light chain kinase
(D) Increased intracellular Ca2+ concentration
(E) Opening of ligand-gated Ca2+ channels

A 56-year-old woman with severe muscle weakness is hospitalized. The only abnormality in her laboratory values is an elevated serum K+ concentration. The elevated serum K+ causes muscle weakness because
(A) the resting membrane potential is hyperpolarized
(B) the K+ equilibrium potential is hyperpolarized
(C) the Na+ equilibrium potential is hyperpolarized
(D) K+ channels are closed by depolarization
(E) K+ channels are opened by depolarization
(F) Na+ channels are closed by depolarization (G) Na+ channels are opened by depolarization

A newly developed local anesthetic blocks Na+ channels in nerves. Which of the following effects on the action potential would it be expected to produce?
(A) Decrease the rate of rise of the upstroke of the action potential
(B) Shorten the absolute refractory period
(C) Abolish the hyperpolarizing afterpotential
(D) Increase the Na+ equilibrium potential
(E) Decrease the Na+ equilibrium potential

An inhibitory postsynaptic potential
(A) depolarizes the postsynaptic membrane by opening Na+ channels
(B) depolarizes the postsynaptic membrane by opening K+ channels
(C) hyperpolarizes the postsynaptic membrane by opening Ca2+ channels
(D) hyperpolarizes the postsynaptic membrane by opening Cl– channels

At the muscle end plate, acetylcholine (ACh) causes the opening of
(A) Na+ channels and depolarization toward the Na+ equilibrium potential
(B) K+ channels and depolarization toward the K+ equilibrium potential
(C) Ca2+ channels and depolarization toward the Ca2+ equilibrium potential
(D) Na+ and K+ channels and depolarization to a value halfway between the Na+ and K+ equilibrium potentials
(E) Na+ and K+ channels and hyperpolarization to a value halfway between the Na+ and K+ equilibrium potentials

D. C. F. A. D. D.

Which of the following would occur as a result of the inhibition of Na+, K+-ATPase?
(A) Decreased intracellular Na+ concentration
(B) Increased intracellular K+ concentration
(C) Increased intracellular Ca2+ concentration
(D) Increased Na+–glucose cotransport
(E) Increased Na+–Ca2+ exchange

In skeletal muscle, which of the following events occurs before depolarization of the T tubules in the mechanism of excitation–contraction coupling?
(A) Depolarization of the sarcolemmal membrane
(B) Opening of Ca2+ release channels on the sarcoplasmic reticulum (SR)
(C) Uptake of Ca2+ into the SR by Ca2+-adenosine triphosphatase (ATPase)
(D) Binding of Ca2+ to troponin C
(E) Binding of actin and myosin

Adenosine triphosphate (ATP) is used indirectly for which of the following processes?
(A) Accumulation of Ca2+ by the sarcoplasmic reticulum (SR)
(B) Transport of Na+ from intracellular to extracellular fluid
(C) Transport of K+ from extracellular to intracellular fluid
(D) Transport of H+ from parietal cells into the lumen of the stomach
(E) Absorption of glucose by intestinal epithelial cells

Repeated stimulation of a skeletal muscle fiber causes a sustained contraction (tetanus). Accumulation of which solute in intracellular fluid is responsible for the tetanus?

(A) Na+
(B) K+
(C) Cl–
(D) Mg2+
(E) Ca2+
(F) Troponin
(G) Calmodulin
(H) Adenosine triphosphate (ATP)

A 42-year-old man with myasthenia gravis notes increased muscle strength when he is treated with an acetylcholinesterase (AChE) inhibitor. The basis for his improvement is increased
(A) amount of acetylcholine (ACh) released from motor nerves (B) levels of ACh at the muscle end plates
(C) number of ACh receptors on the muscle end plates
(D) amount of norepinephrine released from motor nerves
(E) synthesis of norepinephrine in motor nerves

C. A. E. E. B.

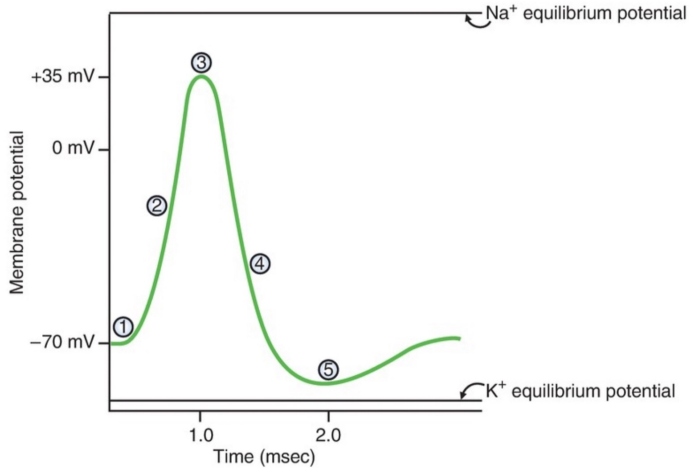
Which of the following causes rigor in skeletal muscle? (A) Lack of action potentials in motoneurons
(B) An increase in intracellular Ca2+ level
(C) A decrease in intracellular Ca2+ level
(D) An increase in adenosine triphosphate (ATP) level
(E) AdecreaseinATPlevel

Which characteristic or component is shared by skeletal muscle and smooth muscle?
(A) Thick and thin filaments arranged in sarcomeres
(B) Troponin
(C) Elevation of intracellular [Ca2+] for excitation–contraction coupling
(D) Spontaneous depolarization of the membrane potential
(E) High degree of electrical coupling between cells

Which of the following temporal sequences is correct for excitation–contraction coupling in skeletal muscle?
(A) Increased intracellular [Ca2+]; action potential in the muscle membrane; cross-bridge formation
(B) Action potential in the muscle membrane; depolarization of the T tubules; release of Ca2+ from the sarcoplasmic reticulum (SR)
(C) Action potential in the muscle membrane; splitting of adenosine triphosphate (ATP); binding of Ca2+ to troponin C
(D) Release of Ca2+ from the SR; depolarization of the T tubules; binding of Ca2+ to troponin C

Last 2 questions depending on the following picture

What process is responsible for the change in membrane potential that occurs between point 1 and point 3?
(A) Movement of Na+ into the cell
(B) Movement of Na+ out of the cell
(C) Movement of K+ into the cell
(D) Movement of K+ out of the cell
(E) Activation of the Na+–K+ pump
(F) Inhibition of the Na+–K+ pump




What process is responsible for the change in membrane potential that occurs between point 3 and point 4?
(A) Movement of Na+ into the cell
(B) Movement of Na+ out of the cell
(C) Movement of K+ into the cell
(D) Movement of K+ out of the cell
(E) Activation of the Na+–K+ pump
(F) Inhibition of the Na+–K+ pump

E. C. B. A. D.

1.Which phase of the nerve action potential is responsible for propagation of the action potential to neighboring sites?

2. In skeletal muscle, at muscle lengths less than the length that generates maximum active tension, is active tension greater than, less than, or approximately equal to total tension?

3. How does hyperkalemia alter resting membrane potential (depolarizes, hyperpolarizes, or has no effect), and why does this cause muscle weakness?

4. During which of the following steps in cross-bridge cycling in skeletal muscle is ATP bound to myosin: rigor, conformational change in myosin that reduces its affinity for actin, power stroke?

## Ans:

1. Upstroke of the action potential

2. Approximately equal to (Hint: Passive tension is negligible in this range.)

3. Depolarizes; causes muscle weakness by closing inactivation gates on Na+ channels so that they are unavailable to carry Na+ current for upstroke of muscle action potential

4. Conformational change in myosin that reduces its affinity for actin

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