

Group 5 (the best one)

Muscle Physiology

1. Curare is a toxin that prevents acetylcholine esterase from breaking down ACh in the neuromuscular junction. This causes tetanus, a state of continuous contraction, in muscles. Which areas of the sarcomere will stay shortened in this condition?
 - a. H zone and I zone
 - b. A zone and dead zone
 - c. M line and H zone
 - d. Z line and H zone
2. Muscles use an enormous amount of energy. That is why there are glycogen stores inside. What is the primary function of ATP in sarcomeres?
 - a. To replace the AMP attached to the myosin heads
 - b. For the myosin heads to bind the myosin binding site
 - c. To dissociate the myosin heads from the thin filament
 - d. To regenerate the nuclear energy of the phosphates
3. When ATP is bound to the myosin head, what is the immediate energy configuration of the myosin head?
 - a. High energy configuration
 - b. Low energy configuration
 - c. Nuclear energy configuration
 - d. Zero energy configuration
4. Smooth muscle fibers differ from skeletal and cardiac muscles in that they lack striations. What is the basic functional unit of a muscle cell that can be seen as striations in skeletal muscle?
 - a. Myosin
 - b. Sarcomere
 - c. Adenosine triphosphate
 - d. Sacrum
5. Thick filaments composed of myosin do not shorten when skeletal muscle contracts. Which corresponding area of a sarcomere does not change during a contraction?
 - a. I band
 - b. A band
 - c. H zone
 - d. Z line

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6. Muscles are usually attached in antagonistic pairs. While the triceps contract, how much free Ca^{2+} are in the biceps compared to the triceps?
- a. Biceps will have little free Ca^{2+} in the sarcoplasm
 - b. Biceps will have high levels of free Ca^{2+} in sarcoplasm
 - c. Biceps will have no free Ca^{2+} in sarcoplasm
 - d. None of the above
7. While a muscle is at rest, myosin heads bind _____. This molecule is then hydrolyze to form a cross bridge. The release of _____ causes the power stroke where the thin filament moves towards the center of a sarcomere, the ____ line.
- a. ADP, ATP, Z
 - b. AMP, ATP, M
 - c. ATP, ADP, A
 - d. ATP, ADP, M
8. Why is calcium needed for muscle contraction?
- a. Calcium binds to tropomyosin and closes myosin binding sites
 - b. It binds to the troponin complex and opens myosin binding sites.
 - c. It binds to sarcomeres and generates an action potential
 - d. To regenerate the ATP stores in the muscle
9. Choose the correct order of muscle structure from the largest to smallest unit
- a. Sarcomere → myofibril → muscle fiber → Muscle
 - b. Muscle → myofibril → sarcoplasm → sarcomere
 - c. Muscle → bifurcated myosin → myofibril → sarcoplasm
 - d. Muscle → muscle fibers → myofibril → sarcomere
10. Sarcomere length is longest when a muscle fiber is:
- a. completely contracted
 - b. completely relaxed
 - c. partially contracted
 - d. partially contracted
11. Cross-bridge formation is essential in the sliding filament model for muscle contraction. It occurs immediately after which of the following events?
- a. autosomal genome duplication
 - b. ATP binding
 - c. cross-bridge dissociation

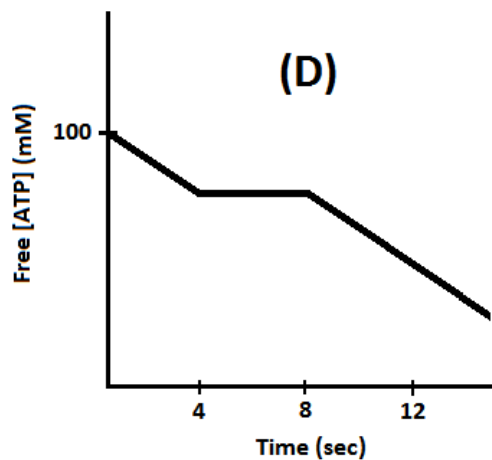
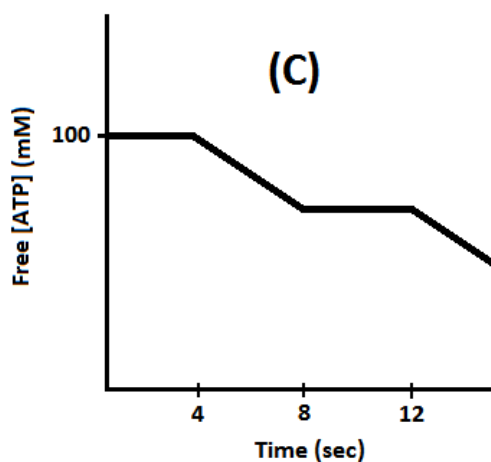
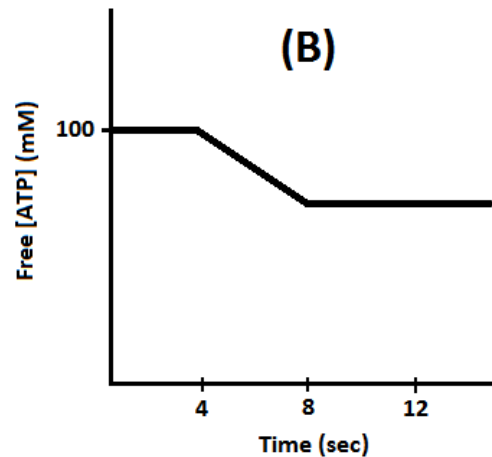
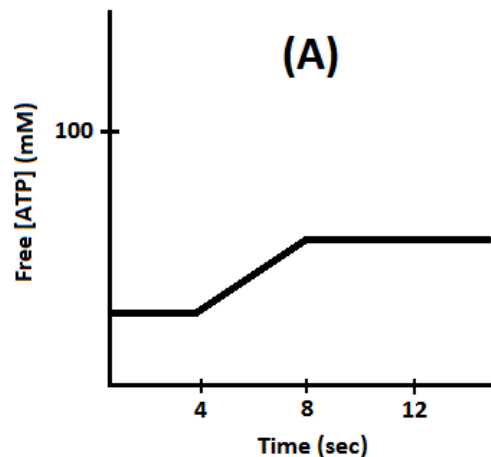
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d. ATP hydrolysis

12. You have a muscle fiber in a saline solution with 100 mM ATP, 2 mM Mg^{2+} , and 2 mM Ca^{2+} . The muscle is stimulated via an electrode every second. At 4 seconds you add a compound that binds all Ca^{2+} and removes it from solution. At 8 seconds a compound that exposes myosin binding sites by binding troponin is added. At 12 seconds, additional Ca^{2+} is added into the solution. Which letter corresponds to the chart that best represents usage of ATP over time?

(D)

0 sec, ATP is used up as the muscle contracts and relaxes. 4 sec, without Ca^{2+} to bind troponin, the myosin binding sites are blocked and the muscle cannot contract. No ATP is used. 8 sec, myosin heads can bind again and the muscle contraction uses up ATP. 12 sec, no change because the myosin binding sites are already exposed.



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