

CSCS Exam Scientific Foundations Study Question Answers
30 Questions

1. (C) Myofibril. A myofibril is an organizational component of a muscle cell that contains contractile proteins. Epimysium, perimysium, and endomysium are all types of fibrous connective tissue involved in skeletal muscle.
2. (B) Muscle Fibers. Endomysium connective tissue surrounds each individual muscle fiber. Perimysium connective tissue surrounds each muscle fascicle. Epimysium connective tissue surrounds the entire muscle.
3. (C) Closer to the trunk. Proximal means that a body part is closer to the trunk (relative to another body part). For example, the elbow is proximal compared to the wrist, but when compared to the upper arm, the elbow is “distal” (further from the trunk).
4. (B) PR Interval. This section spans from the start of the P-Wave to the beginning of the QRS Complex.
5. (C) Type IIx. Type IIx fibers generate the most force so they are primarily anaerobic, thus they have low aerobic enzyme content.
6. (C) Membrane of a muscle cell.
7. (B) Motor End Plate.
8. (C) Remains the same. The M-line is the middle of the sarcomere and does not move.
9. (B) False. Each muscle cell can only be innervated by a single motor neuron.
10. (C) Glycogen. The sarcoplasm is the storage site for glycogen in muscle cells.
11. (B) Myofilament. Actin is a myofilament. Myofilaments make up myofibrils.
12. (B) False. The I-Band in the sarcomere corresponds to the space near the Z-Line in which actin is not overlapped by myosin. As a muscle contracts, the Z-Lines are pulled inwards towards the M-Line, causing the I-Band to shorten in length. The A-Band corresponds with the length of the actin filament.
13. (C) Motor Neuron Depolarization, Acetylcholine Release, Sarcolemma Depolarization, Calcium Release. The motor signal is transmitted down the motor neuron. When the signal reaches the end of the neuron, acetylcholine neurotransmitter is released into the neuromuscular junction. Acetylcholine triggers depolarization of the muscle cell sarcolemma. Sarcolemma depolarization triggers calcium release within the muscle cell from the sarcoplasmic reticulum.
14. (G) Perimysium. This is fibrous connective tissue that surrounds each muscle fascicle.

15. (A) Acetylcholine Release. Acetylcholine is released from the motor neuron into the neuromuscular junction. All other events listed as answer choices occur after acetylcholine triggers sarcolemma depolarization in the muscle cell.
16. (C) Length of a myosin filament.
17. (A) Muscle Fascicle. An individual muscle fascicle is composed of up to 150 muscle fibers / cells. The muscle fascicle is surrounded by perimysium fibrous connective tissue.
18. (B) False. Six actin myofilaments surround each actin filament.
19. (B) Decreases. Concentric muscle action means that the muscle is undergoing shortening. As the sarcomere shortens in length, the H-Zone decreases in size.
20. (B) Low. Calcium is released from the sarcoplasmic reticulum into the sarcoplasm when a muscle cell is activated. When the muscle cell is at rest, calcium is taken back up into the sarcoplasmic reticulum.
21. (B) False. A motor unit is only composed of a single type of muscle fiber.
22. (B) Propagate an action potential into the muscle cell interior. Transverse tubules are invaginations of the sarcolemma into the interior of the muscle cell. As the action potential spreads across the surface of the muscle cell, the transverse tubules allow the depolarization to descend into the muscle cell's interior.
23. (B) High involvement. A 100 meter sprint is a high intensity, short duration, highly anaerobic activity. Type II muscle fibers will likely have high relative involvement.
24. (B) Frequency of motor unit activation. The more frequently that a muscle cell is activated, the more that the force generated is able to sum together.
25. (C) Proprioceptors.
26. (D) Muscle Spindle. When muscle spindles detect a muscle being stretched, their signal synapses in the spinal cord on a motor neuron that activates the same muscle. Golgi tendon organs are proprioceptors in the tendons that work like muscle spindles, but they inhibit muscle activation.
27. (B) Left Ventricle. The left ventricle receives oxygenated blood from the left atria and pumps the oxygenated blood out to the body (systemic circulation).
28. (C) Sarcoplasmic Reticulum. When a muscle cell is activated, the sarcoplasmic reticulum releases calcium into the sarcoplasm for interaction with troponin on actin myofilaments.
29. (C) Sternocleidomastoid.

30. (A) Fast-Twitch. Type II fibers are fast-twitch, Type I fibers are slow-twitch.