

CSCS Practice Question Preview

A critical part of studying for the CSCS exam is practicing test questions. However, just practicing questions is not enough. Every question should be “milked” out for all its worth. Each question is an opportunity to hone in on topics you don’t yet have a good grasp on.

To aid you with that, here is a sample of practice questions. Also, I’ve included explanations and heuristics to help you understand the content, rather than just use rote memorization.

1. The lowest myoglobin content is found in which of the following muscle fiber types?

- A. I
- B. IIa
- C. Ix
- D. III

2. Activation of which of the following structures causes relaxation of a muscle:

- A. Muscle spindles
- B. Golgi tendon organs
- C. Intrafusal fibers
- D. Extrafusal fibers

3. Force output of a muscle can be increased by:

- I. Increasing the number of motor units activated
- II. Increasing the frequency of firing of individual motor units
- III. Increasing the strength of the action potential
- IV. Increasing the amount of acetylcholine released, well beyond the minimum

- A. I, IV
- B. I, II, III
- C. I, II
- D. II, IV

4. Caffeine supplementation would primarily provide which of the following benefits to a powerlifting athlete?

- A. Increased mental alertness
- B. Increased maximal strength output
- C. Increased hypertrophy

D. A synergistic effect with creatine to increase maximal strength output

5. While a basketball athlete practices free throws, a coach should use which of the following reinforcement strategies:

A. Say “Great job” after each successful free throw

B. Bench the athlete for the first 10 minutes of the next game if they make less than 50% of free throws

C. Assign 10 pushups after every missed free throw

D. Stay silent to let the athlete improve their self-efficacy

Answers:

1. B

Myoglobin is found in muscle and transports oxygen into/throughout the muscle cell.

Hemoglobin is found in red blood cells and transports oxygen throughout the circulatory system to be distributed to various tissues.

Myoglobin will be found in higher content in muscles that rely more on aerobic energy systems (and vice versa, less myoglobin is found in muscles that rely more on anaerobic energy systems). **Type I fibers, or slow twitch fibers**, are fatigue resistant, have a high capacity for aerobic energy production, and have a low capacity for rapid force production. On the other hand **type IIa and IIx fibers, or fast twitch fibers**, fatigue quickly, have a poor capacity for aerobic energy production, and high a capacity for rapid force production. Type I and type IIx fibers are the extreme ends of the spectrum-type I are the most aerobic and weakest and type IIx are the most anaerobic and strongest. Type IIa fibers are a hybrid with qualities of both.

Type I fibers produce high amounts of aerobic energy so they have much more **myoglobin**. On the other hand, type II fibers do not rely heavily on aerobic energy systems, so they have much less myoglobin.

To remember the difference between type IIa and type IIx fibers, think of “A”=awesome. Type IIa fibers are “awesome” because they have qualities of type I and type IIx fibers and can be thought of as a hybrid of each.

2. B

Proprioceptors are the sensory receptors in joints, muscle, and tendons that respond to pressure and tension. The 2 main types are **muscle spindles** and **Golgi tendon organs (GTO's)**.

Muscle spindles are a specialized fiber found within muscles. Muscle spindles are considered **intrafusal fibers** because they are within the muscle. Muscle spindles run parallel to the “normal” (extrafusal) muscle fibers.

Muscle spindles sense *lengthening of a muscle*, so when lengthened (stretched), they cause a reflexive contraction of that same muscle. An example, is the patellar reflex. By tapping the tendon of the quadriceps, the muscle is shortened which activates this reflex, causing a quadriceps contraction.

On the other hand **GTO's** are found at the musculotendinous junction. They *sense lengthening of the tendon of the active muscle*. When a heavy load is placed on a muscle, the GTO actually inhibits muscular contraction, causing it to relax. Researchers believe that one of the neuromuscular adaptations of resistance training is the ability to override this relaxation response caused by **GTO's**.

3. C

The force output of a muscle is determined by: the number of units activated (**recruitment**) and the frequency of activation of those units (**rate coding**). A muscle produces more force when more motor units are activated and/or those motor units are activated at a higher frequency. Besides, the neurological factors of recruitment and rate coding, the morphological factor of muscle cross sectional area determines force output. Increased muscle cross sectional area (hypertrophy) means a larger output of force.

The action potential to create a muscular contraction is caused by *sufficient* acetylcholine release. However, beyond the minimum level required, more acetylcholine release does not create higher force output.

Also, the strength of the action potential does not determine the force output, rather the frequency of the action potentials (**rate coding**) determines the force output.

To remember the three main ways of increasing muscular force output, we'll use a car analogy.

-You can go faster in car by upgrading the engine of the car. Getting a more powerful engine allows you to go faster-let's say upgrading from a V6 Toyota Camry to a V8 Corvette. This is the effect of adding muscle cross-sectional area (**hypertrophy**).

-You can go faster by making the engine more efficient. Maybe you already have a Corvette, but only half the cylinders in the engine are firing. You tighten a few screws and now all cylinders fire. Through training, we can increase the recruitment of MORE motor units, thus increasing the force output (**recruitment**).

-You can go faster by learning to shift into higher gears. You might be pushing the gas pedal, but if you're stuck in 1st gear, you won't be going very fast. Being able to shift up to your top gear lets you access those higher speeds. Through training, we can increase the frequency of activating motor units (**rate coding**).

4. A

Caffeine appears to benefit both anaerobic and aerobic athletes. The main benefits are **increased mental alertness, improved work capacity, and decreased feelings of exertion**.

In aerobic events, caffeine increases time to exhaustion. In anaerobic events, caffeine may increase power performance in trained athletes.

In any case, the recommended dosage is 3-9 mg/kg bodyweight taken 60 minutes before exercise or during prolonged exercise. A lethal dose is 5 g. As a reference point, a typical cup of coffee has 120 mg of caffeine.

5. A

In coaching, behavior change strategies can help modify athlete behaviors. These strategies can be positive or negative and are focused on reinforcement or punishment.

In **“Positive” behavior change strategies the coach ADDS something.** However, this doesn’t mean that it is always something good. On the other hand, in **“negative” behavior change strategies, the coach SUBTRACTS something.**

Now for the terms reinforcement and punishment. **Reinforcement strategies focus on promoting the desired behavior (successful performance of the task). Punishment strategies focus on eliminating undesired behavior (errors in performance of the task).**

So when we put these together, **positive reinforcement is ADDING something as a reward for the desired/correct behavior.** In this question, we are ADDING the “Great job” to promote the desired behavior of making the free throw.

On the other hand, **negative reinforcement is SUBTRACTING something seen as bad to promote the desired/correct behavior.** An example would be SUBTRACTING wind sprints at the end of practice to promote the desired behavior of making the free throw.

Positive punishment is ADDING something bad to eliminate undesired/incorrect behavior. In this question, assigning 10 pushups is ADDING something bad to eliminate the undesired behavior of missing the free throw.

Negative punishment is SUBTRACTING something good to eliminate undesired/incorrect behavior. In this question, benching the athlete for the first 10 minutes of the next game is SUBTRACTING something good to eliminate the undesired behavior of missing the free throw.

Here is a summary in table format:

	Positive Strategy	Negative Strategy
Reinforcement	ADD reward for correct behavior	SUBTRACT bad thing to reward correct behavior
Punishment	ADD bad thing to punish incorrect behavior	SUBTRACT good thing to punish incorrect behavior

Generally, coaches should use reinforcement strategies to help athletes focus on what they do correctly. Positive reinforcement strategies tends to promote the athletes focus on task relevant cues such as the ball, hoop, and the motions of the free throw. On the other hand **punishment promotes a focus on irrelevant cues** which can decrease performance.