

# Physiology MCQ

---

Resources

---

Guyton and Hall Physiology

---

Oxford press

---



### Question 1

---

The ends of the actin filaments are anchored (attached) to the:

- a) M-line
  - b) Z-line
  - c) Perimysium
  - d) Sarcoplasmic reticulum
- 

### Question 2

---

When a muscle fibre shortens, the following also shortens:

- a) Sarcomere
  - b) Actin filament
  - c) Myosin filament
  - d) Z-line
- 

### Question 3

---

In regard to the cross-bridge (CB) power stroke, it is true that:

- a) In concentric contractions, the CB power stroke pulls the actin filament toward the center of the sarcomere, causing sarcomere shortening.
  - b) In eccentric contractions, the CB power stroke pushes the actin filament away from the centre of the sarcomere, causing sarcomere lengthening.
  - c) In isometric contractions, the CB power stroke pulls the actin filament straight down, preventing shortening or lengthening.
  - d) All of the above are true.
- 

### Question 4

---

During one cross-bridge (CB) cycle:

- a) The CB binds to troponin.
  - b) ATP binds to the actin binding site.
  - c) One molecule of ATP is used.
  - d) The CB performs two power-strokes.
-

### Question 5

---

In excitation-contraction coupling:

- a) The muscle action potential propagates along the sarcolemma and down the transverse tubules.
  - b)  $\text{Ca}^{2+}$  released from the sarcoplasmic reticulum binds to tropomyosin.
  - c) Troponin blocks binding of myosin heads to actin filaments.
  - d) Relaxation occurs when  $\text{Ca}^{2+}$  is excreted from the muscle fibre.
- 

### Question 6

---

The sarcoplasmic reticulum does **not**:

- a) Surround each myofibril.
  - b) Release  $\text{Ca}^{2+}$  in response to a muscle action potential.
  - c) Has a  $\text{Ca}^{2+}$  "pump" in its membrane.
  - d) Make up about 95% of the contents of a muscle fibre.
- 

### Question 7

---

The force of a tetanic contraction is greater than that of a twitch contraction because:

- a) More acetylcholine is released at the neuromuscular junction per nerve impulse.
  - b) More  $\text{Ca}^{2+}$  is released in a tetanic contraction.
  - c) The muscle action potentials travel faster along the transverse tubules.
  - d) The muscle action potentials are smaller during a tetanic contraction.
- 

### Question 8\*

---

Muscle fiber A contractions are stronger than M.fiber B contractions partly because, in A contractions: (A&B in same motor unit)

- a) More muscle fibres within a muscle are activated.
  - b) more cross-bridges are attached to actin at a given time.
  - c) Muscle fibres are conducting muscle action potentials at a higher frequency.
  - d) More ATP is used in each cross-bridge cycle.
- 

### Question 9

---

As shortening velocity increases, concentric force decreases because:

- a) There is a progressive decrease in the number of attached cross-bridges.
  - b) Cross-bridge cycles become slower.
  - c) Muscle action potentials propagate more slowly.
  - d) All of the above.
-

### Question 10

---

The decrease in active force that occurs at lengths longer than the optimal length ( The muscle length at which maximal active force occurs) is caused by:

- a) Overlap of actin filaments with each other.
- b) Neural inhibition.
- c) Insufficient  $\text{Ca}^{2+}$  release.
- d) Insufficient overlap of actin and myosin filaments.

### Question 11

---

The muscle strength could be altered by:

- a) Training
- b) Fatigue
- c) Injury
- d) All of the above

### Question 12

---

**During a demonstration for medical students, a neurologist uses magnetic cortical stimulation to trigger firing of the ulnar nerve in a volunteer. At relatively low-amplitude stimulation, action potentials are recorded only from muscle fibers in the index finger. As the amplitude of the stimulation is increased, action potentials are recorded from muscle fibers in both the index finger and the biceps muscle. What is the fundamental principle underlying this amplitude-dependent response? (conclude)**

- A) Large motor neurons that innervate large motor units require a larger depolarizing stimulus
- B) Recruitment of multiple motor units requires a larger depolarizing stimulus
- C) The biceps muscle is innervated by more nerves
- D) The motor units in the biceps are smaller than those in the muscles of the fingers
- E) The muscles in the fingers are innervated only by the ulnar nerve

### Question 13

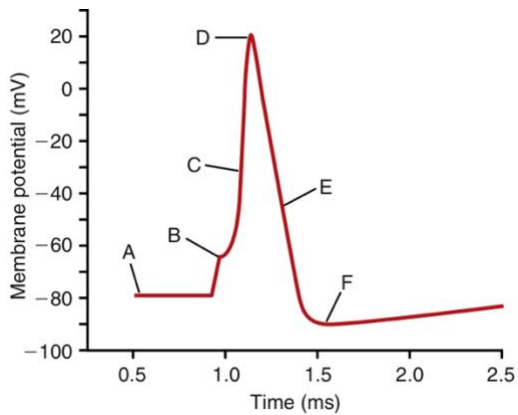
---

**Weight lifting can result in a dramatic increase in skeletal muscle mass. This increase in muscle mass is primarily attributable to which of the following?**

- A) Fusion of sarcomeres between adjacent myofibrils
- B) Hypertrophy of individual muscle fibers
- C) Increase in skeletal muscle blood supply
- D) Increase in the number of motor neurons
- E) Increase in the number of neuromuscular junctions

## Question 14

---



The above figure shows the change in membrane potential during an action potential in a giant squid axon. Refer to it when answering Questions 1 and 2.

**1. Which of the following is primarily responsible for the change in membrane potential between points B and D?**

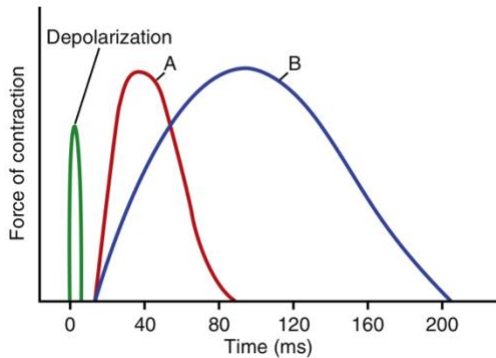
- A) Inhibition of the Na<sup>+</sup>, K<sup>+</sup>-ATPase
- B) Movement of K<sup>+</sup> into the cell
- C) Movement of K<sup>+</sup> out of the cell
- D) Movement of Na<sup>+</sup> into the cell
- E) Movement of Na<sup>+</sup> out of the cell

**2. Which of the following is primarily responsible for the change in membrane potential between points D and E?**

- A) Inhibition of the Na<sup>+</sup>, K<sup>+</sup>-ATPase
  - B) Movement of K<sup>+</sup> into the cell
  - C) Movement of K<sup>+</sup> out of the cell
  - D) Movement of Na<sup>+</sup> into the cell
  - E) Movement of Na<sup>+</sup> out of the cell
-

## Question 15

---



The above figure illustrates the single isometric twitch characteristics of two skeletal muscles, A and B, in response to a depolarizing stimulus. Refer to it when answering Questions 1 and 2.

**1. Which of the following best describes muscle B compared with muscle A?**

- A) Adapted for rapid contraction
- B) Composed of larger muscle fibers
- C) Fewer mitochondria
- D) has smaller muscles fibers
- E) Less extensive blood supply

**2. The delay between the termination of the transient depolarization of the muscle membrane and the onset of muscle contraction observed in both muscles A and B reflects the time necessary for which of the following events to occur?**

- A) ADP to be released from the myosin head
  - B) ATP to be synthesized
  - C)  $\text{Ca}^{++}$  to accumulate in the sarcoplasm
  - D) G-actin to polymerize into F-actin
  - E) Myosin head to complete one cross-bridge cycle
- 

## Question 16

---

*Sarcoplasm* A 55-year-old woman visits her physician because of double vision, eyelid droop, difficulty chewing and swallowing, and general weakness in her limbs. All these symptoms worsen with exercise and occur more frequently late in the day. The physician suspects myasthenia gravis and orders a Tensilon test. The test is positive. Use this information when answering Questions 1–2.

**1. What is the most likely basis for the symptoms described in this patient?**

- A) Autoimmune response
- B) Botulinum toxicity
- C) Depletion of voltage-gated Ca<sup>++</sup> channels in certain motor neurons
- D) Development of macro motor units after recovery from poliomyelitis
- E) Overexertion

**2. Which of the following drugs would likely alleviate this patient's symptoms?**

- A) Atropine
  - B) Botulinum toxin antiserum
  - C) Curare
  - D) Halothane
  - E) Neostigmine ( acetylcholinesterase inhibitors )
- 

### Question 17

---

**A 17-year-old soccer player sustained a fracture to the left tibia. After her lower leg has been in a cast for 8 weeks, she is surprised to find that the left gastrocnemius muscle is significantly smaller in circumference than it was before the fracture. What is the most likely explanation?**

- A) Decrease in the number of individual muscle fibers in the left gastrocnemius
  - B) Decrease in blood flow to the muscle caused by constriction from the cast
  - C) Temporary reduction in actin and myosin protein synthesis
  - D) Increase in glycolytic activity in the affected muscle
  - E) Progressive denervation
- 

### Answers

---

- |      |       |              |
|------|-------|--------------|
| 1) B | 7) B  | 13) B        |
| 2) A | 8) B  | 14) 1D // 2C |
| 3) A | 9) A  | 15) 1D // 2C |
| 4) C | 10) D | 16) 1A // 2E |
| 5) A | 11) D | 17) C        |
| 6) D | 12) A |              |
-