



4

CHECK YOUR UNDERSTANDING



Multiple Choice

1. The three types of muscle in the human body are:

- A) skeletal, smooth, abdominal
- B) skeletal, smooth, cardiac
- C) skeletal, vascular, cardiac
- D) motor, smooth, cardiac
- E) none of the above

Answer: _____

2. The contractile unit of a muscle is:

- A) muscle fiber
- B) myofilament (myofibril)
- C) sarcomere
- D) myosin
- E) actin

Answer: _____

3. Which of the following statements regarding muscle fiber types is **true**:

- A) The number of FT and ST fibers does not vary from one individual to another.
- B) Most skeletal muscles contain both FT and ST fibers.
- C) Individual performance differences cannot be attributed to the varying percentages of the muscle fiber types.
- D) The number of FT and ST fibers varies from one muscle to another.
- E) Both B and D.

Answer: _____

4. Which of the following statements regarding the motor unit is **true**:

- A) Each motor unit can consist of a different number of muscle fibers.
- B) All muscle fibers of one particular motor unit are always the same fiber type.
- C) A muscle can be composed of a different number of motor units.
- D) Each muscle fiber can be innervated by only one motor unit.
- E) All of the above.

Answer: _____

5. Which of the following statements regarding the differences between trained and untrained individuals is **false**:

- A) Trained individuals have a larger muscle mass and therefore can produce greater force.

- B) Trained individuals further develop strength only by improving intra-muscle coordination.
- C) Trained individuals can activate a larger number of muscle fibers to produce greater force.
- D) Trained individuals have a much smaller muscle force deficit.
- E) None of the above.

Answer: _____



Fill in the Blanks

Fill in the blanks for the following statements using words from the **word bank** below. Place the corresponding letter from the word bank in the blank spaces provided.

1. The _____ of muscle tissue determines its specific function.
2. The specific function of muscle tissue is to _____.
3. The agonist is also known as the _____.
4. In strength training, an individual's performance improvements occur through a process of _____.
5. The end of the muscle attached to the bone that does **not** move is called the _____, while the point of attachment of the muscle on the bone that moves is the _____.

Word Bank

- | | | |
|--------------------------|----------------|--------------|
| a. activation | d. insertion | g. size |
| b. biological adaptation | e. origin | h. structure |
| c. contract | f. prime mover | i. synergist |



True or False

Indicate whether each statement is **true (T)** or **false (F)**. If the statement is false, provide the correct answer.

1. There are fiber types with characteristics that fall in between the extremes of Type I and Type II.

Answer: _____



2. Most skeletal muscle is attached to another skeletal muscle, and its contraction is responsible for supporting and moving the skeleton.

Answer: _____

4. Simultaneous and additive shortening of sarcomeres within muscle fibers ultimately leads to muscle contraction.

Answer: _____

3. Untrained individuals can normally activate up to 60 percent of the motor units of a muscle at the same time.

Answer: _____

5. The specific number of fibers in a motor unit of any given muscle varies.

Answer: _____



Think and Link



1. Match the following terms with their corresponding function/characteristic. Terms can be matched with more than one answer.

Term	Answer	Function/Characteristic
Agonist/prime mover	_____	A) A muscle or group of muscles opposing a desired action
Antagonist	_____	B) Muscle that acts as an antagonist during bending of the elbow (i.e., flexion)
Biceps	_____	C) The muscles surrounding the joint being moved and supporting it in the action
Triceps	_____	D) Muscle that acts as an agonist during bending of the elbow (i.e., flexion)
Synergists	_____	E) Muscle groups that steady joints closer to the body axis.
Fixators	_____	F) A muscle or group of muscles producing a desired action/movement G) The muscles holding your shoulder girdle to your rib cage during hand-over-hand rope climbing.

2. Knowing what you do about muscle fiber types, explain why there is a difference between white and dark meat on a chicken (a flightless bird). Would this differ for birds that fly south for the winter? Do a little research, and summarize the differences between white and dark meat.





Two Great Athletes – Two Completely Different Body Types



Compare and contrast the following two athletes by answering the questions that follow.



Athlete 1 – Sprinter

Jerome is a world-class African American sprinter. He has trained all his life to represent the U.S. at the Olympics and to break the world record in the 100-meter sprint. Jerome is 6 feet tall and has a mass of 190 pounds. He is extremely well built, with a muscular body type. His best time in the 100 meters is 9.84 seconds.

Athlete 2 – Marathon Runner

Akwae is an established marathon runner from Kenya – a world champion in the 42-km (26-mile) event. He is 6 feet tall and has a mass of 155 pounds. Akwae is extremely lean, with a linear body type. He can run a 4-minute mile and has a personal best marathon time of 2 hours and 8 minutes.

- 1) List the three types of muscle in the human body, and identify which type(s) are more efficient in Akwae – the marathon runner.

- 2) The muscles used most by each athlete are the muscles of the thigh. List five thigh muscles, and research the origin and insertion of those muscles.

Muscle	Origin	Insertion

- 3) Muscles work in collaboration with each other. As one muscle flexes, another muscle extends. The muscle known as the agonist is the _____, and the opposing muscle is called the _____. The synergists are the muscles _____ the joint being moved. Other muscles that steady joints closer to the body axis so that the desired action can occur are called _____.



4) Both athletes go through rigorous total body training. Fill in the blanks in the chart below outlining how muscles work together during training.

Movement/Action	Agonist	Antagonist	Synergists	Fixators
Running	Hamstrings		Muscles surrounding the knee joint	Muscles in the posterior hip – gluteals
Lifting		Spinal erectors	Hip flexors	
Climbing	Deltoid and latissimus dorsi		Muscles of the neck (trapezius) and shoulders	
Pushing		Upper back – latissimus dorsi, trapezius		

5) Which athlete possesses more fast twitch (type IIa) muscle fibers? Who possesses more slow twitch (type I) muscle fibers? Who do you think possesses more type IIb muscle fibers? Explain your answer.

6) Other than their athletic training, what major factor influences their muscle fiber composition?

7) Explain the concepts of intramuscular coordination and intermuscular coordination. In your answer state which athlete would be more proficient in each type of coordination.

8) Akwae decides that he wants to train like a sprinter, engaging in a vigorous strength training regime to help him improve his marathon time. Is this the right approach to training for a marathon runner? What will happen to Akwae if he continues to train with explosive strength-based movements/exercises?

9) In the space below, design a sport-specific training program with at least four exercises for *either* Jerome (sprinter) or Akwae (marathon runner).
