# Muscles in Motion

Compare the structures and actions of three muscle tissues

**HAP.5.5** "Compare and contrast the anatomy and physiology of the three types of muscle tissue."

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline two cell features and circle one action in each paragraph, then write a matching number beside a feature shared by two muscle types.

### A Trip Up the Stairs

1. When you climb stairs, skeletal muscle pulls on bones to lift your body. Most skeletal muscles attach to bones by tendons, and their long, cylindrical cells are called fibers. Under a microscope, those fibers show light and dark stripes, called striations. Each fiber contains many nuclei. Nerve signals trigger contractions, and you can usually choose when to start or stop a movement. Skeletal fibers can contract quickly and powerfully, but some tire during repeated effort. Your leg muscles, for example, may feel worn out after many flights of stairs. Other muscle tissues work even when you do not decide to move.

2. As you climb, your heart beats faster to send more blood to your working legs. Cardiac muscle forms most of the heart wall. Like skeletal muscle, its cells are striated, but cardiac cells are shorter, branch, and usually contain one nucleus. Neighboring cells meet at intercalated discs, which help electrical signals spread so the heart contracts in a coordinated rhythm. You do not choose each heartbeat. Cardiac muscle contracts repeatedly without tiring under normal conditions, rather than taking breaks whenever you stop moving. Its steady pumping action moves blood through vessels, supplying oxygen and nutrients to tissues throughout your body.

3. Meanwhile, smooth muscle works in places you may not notice. It is found in the walls of your digestive tract and blood vessels. Its cells are tapered, usually have one nucleus, and lack the visible stripes found in skeletal and cardiac muscle. Smooth muscle acts without conscious choice, like cardiac muscle, but its contractions are often slower and can remain steady for long periods. In the digestive tract, waves of contraction push food along. In blood vessels, contraction can narrow the passage for blood, while relaxation can widen it. These different cell shapes and contraction patterns suit movement, pumping, and control of internal passageways.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. How are skeletal and cardiac muscle cells alike in appearance? How do their shapes and numbers of nuclei differ?

2. Compare your control over skeletal and cardiac muscle. How does each respond to repeated activity?

3. How are cardiac and smooth muscle alike in control, but different in their contraction patterns?

4. Compare the cell shapes of skeletal and smooth muscle. What does each tissue move or change?

## 3 YOUR TURN

Your own words

A student walks to a snack table, eats, and then jogs to class. In four or five sentences, explain how all three muscle tissues contribute. Compare at least two pairs of tissues using cell features, contraction or control, and an action from the scene.

ANSWER KEY

# Muscles in Motion



## PART 1 · READ AND MARK

Underline two cell features and circle one action in each paragraph, then write a matching number beside a feature shared by two muscle types. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | How are skeletal and cardiac muscle cells alike in appearance? How do their shapes and numbers of nuclei differ? | **Both are striated. Skeletal fibers are long and cylindrical with many nuclei. Cardiac cells are shorter and branching, usually with one nucleus.** |
| 2 | Compare your control over skeletal and cardiac muscle. How does each respond to repeated activity? | **Skeletal movement is usually voluntary, and some fibers tire during repeated effort. Heartbeats are not consciously chosen, and cardiac muscle contracts repeatedly without tiring under normal conditions.** |
| 3 | How are cardiac and smooth muscle alike in control, but different in their contraction patterns? | **Both act without conscious choice. Cardiac muscle contracts in a coordinated rhythm, while smooth muscle often contracts more slowly and can remain contracted for long periods.** |
| 4 | Compare the cell shapes of skeletal and smooth muscle. What does each tissue move or change? | **Skeletal fibers are long and cylindrical and pull on bones to move the body. Smooth muscle cells are tapered and push food along or change the width of blood vessels.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

As the student walks and jogs, skeletal muscle pulls on leg bones to move the body. Its long, cylindrical, striated fibers contrast with the heart's shorter, branching, striated cardiac cells. Cardiac muscle beats without conscious choice, pumping blood to the legs as the student jogs, while skeletal movement is usually voluntary. After the snack, smooth muscle's tapered, unstriped cells contract slowly to push food through the digestive tract. Both cardiac and smooth muscle act without conscious choice, but cardiac muscle beats in a coordinated rhythm while smooth muscle can maintain a steady contraction.

Accept equivalent descriptions of striations, cell shape, control, and contraction. In Part 3, look for a distinct action for each tissue and accurate comparisons of at least two tissue pairs.