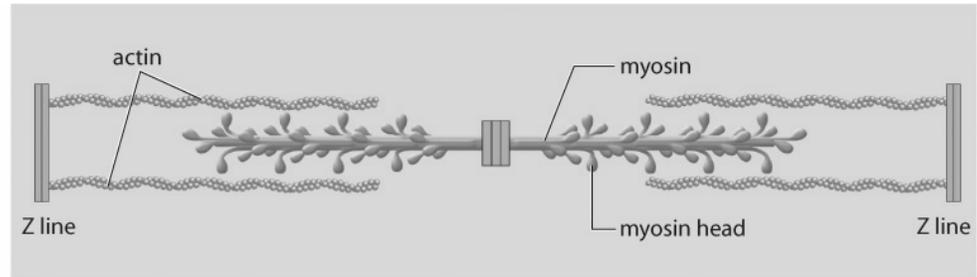


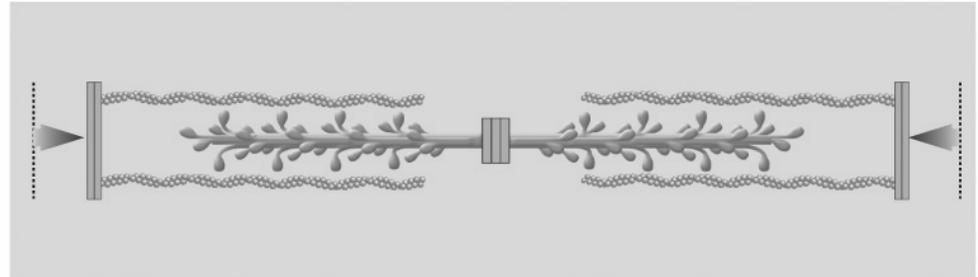
Sliding Filament Model of a Muscle Contraction

The diagram below represents a *functional unit* of skeletal muscle contraction. It shows how actin and myosin myofilaments between two Z lines *function* to create a contraction. A muscle fibre consists of millions of these functional units strung out, end to end, along its length.

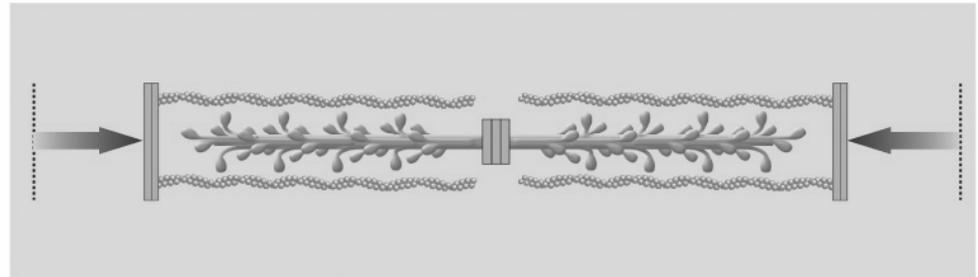
- A** The heads on the two ends of the myosin filament are oriented in opposite directions. When the heads attach to the actin, they bend toward the centre of the myosin.



- B** As one end of the myosin filament draws the actin filament and its attached Z line toward the centre, the other end of the myosin filament does the same.



- C** Both Z lines move toward the centre, and contraction occurs.



1. Explain how the myofilaments produce muscle contraction even though the length of each myofilament does not change.

2. Measurements show that the distance between the two Z lines varies between 1.5 μm and 3.0 μm . How do these measurements relate to the sliding filament model as shown above?

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3. If a muscle is stretched before it is stimulated to contract, then the force it generates when contracting is greatly reduced. How would stretching the muscle before contraction affect the arrangement of the myofilaments? Why would this produce a decrease in the force of contraction?

4. Use the diagram to explain why there is a limit to how much a muscle can shorten as it contracts.

5. As ATP is spent in causing the myofilaments to slide, some of its energy is released as “wasted” heat. In what way is this heat wasted? In what way is it useful to muscle contraction?
