

**CHAPTER 10****ANSWER KEY****Sliding Filament Model of a Muscle Contraction Answer Key****BLM 10.1.5A**

1. During contraction, the myofilaments slide past each other, decreasing the distance between the Z lines along the entire length of the muscle fibre. Because there are millions of Z lines along a muscle fibre, its length decreases.
2. The distance between the Z lines is 3.0  $\mu\text{m}$  at rest and 1.5  $\mu\text{m}$  when contracted.
3. Stretching the muscle would decrease the amount of overlap between the actin and the myosin. This would reduce the opportunity for myosin heads to bind to actin filaments, thereby decreasing the force that pulls the Z lines together.
4. As a muscle contracts, the Z lines are pulled closer to the ends of the myosin filaments. When the Z line bumps into the myosin, further shortening of the muscle is impossible.
5. The heat from ATP breakdown is wasted in the sense that it does not power the reactions between actin and myosin as chemical energy does. However, the heat is useful in warming the muscle, reducing the friction between the myofilaments and increasing the force exerted by the entire muscle as it warms up.