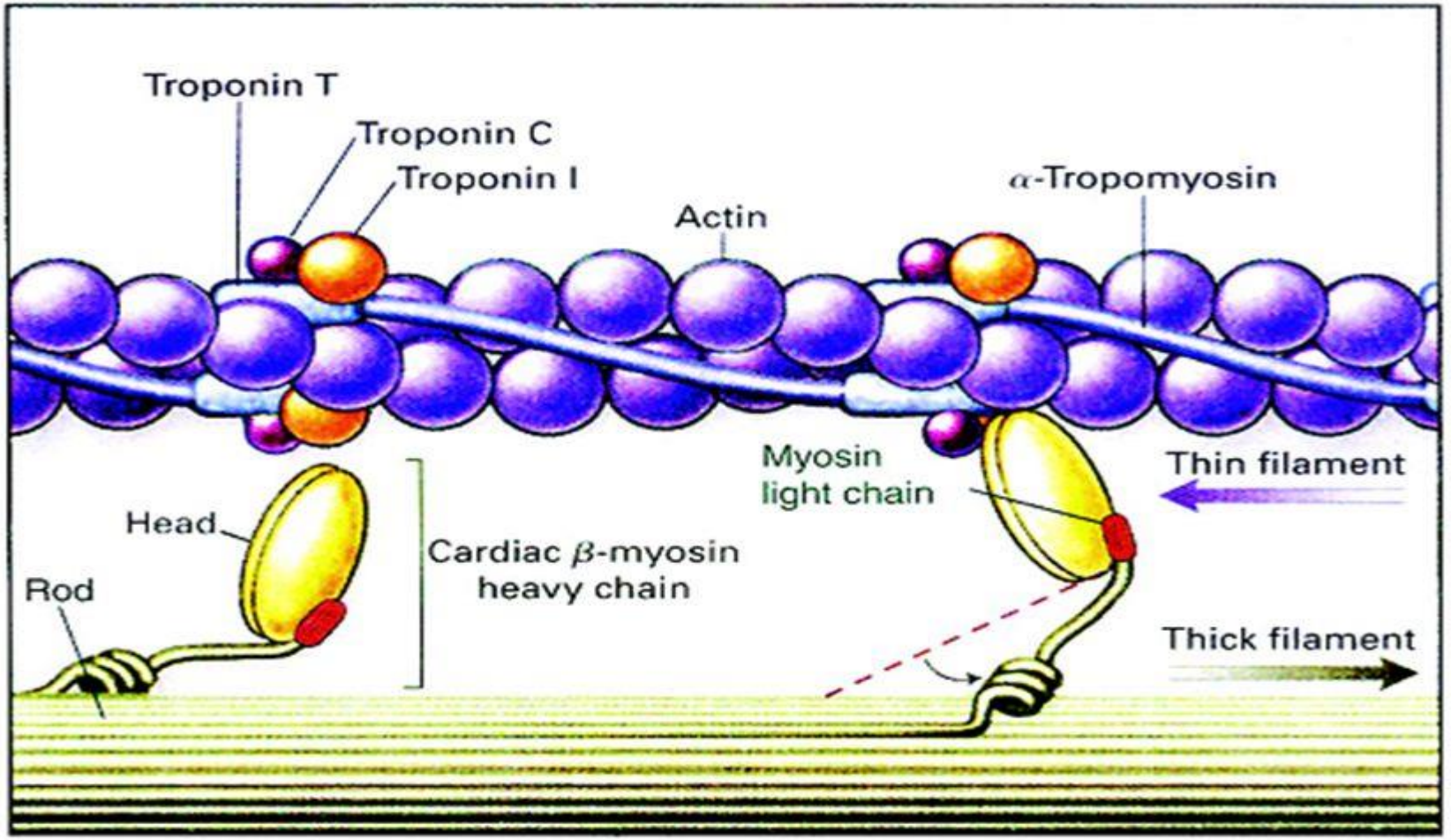
Sliding Filament Theory



Steps to the Sliding Filament Theory

1. A message originates in the brain and is released to the central nervous system (CNS)
2. The message travels down the spinal cord and then to the peripheral nervous system (PNS)
3. The message travels from the axon branch (pathway) to the axon terminal of the muscle.

Steps 4-6

4. The message is carried through the axon terminal via acetylcholine (Ach) to the sarcolemma of each muscle fibre involved

5. Ach causes calcium (Ca+) to be released

6. Ca+ ions find their way to the attachment sites on troponin (found on actin's tropomyosin)

Steps 7-9

7. Tropomyosin swivels, causing the binding sites for myosin (on actin) to be exposed

8. Myosin heads attach to the binding sites on actin

9. ATP is broken down by ATPase causing the power stroke

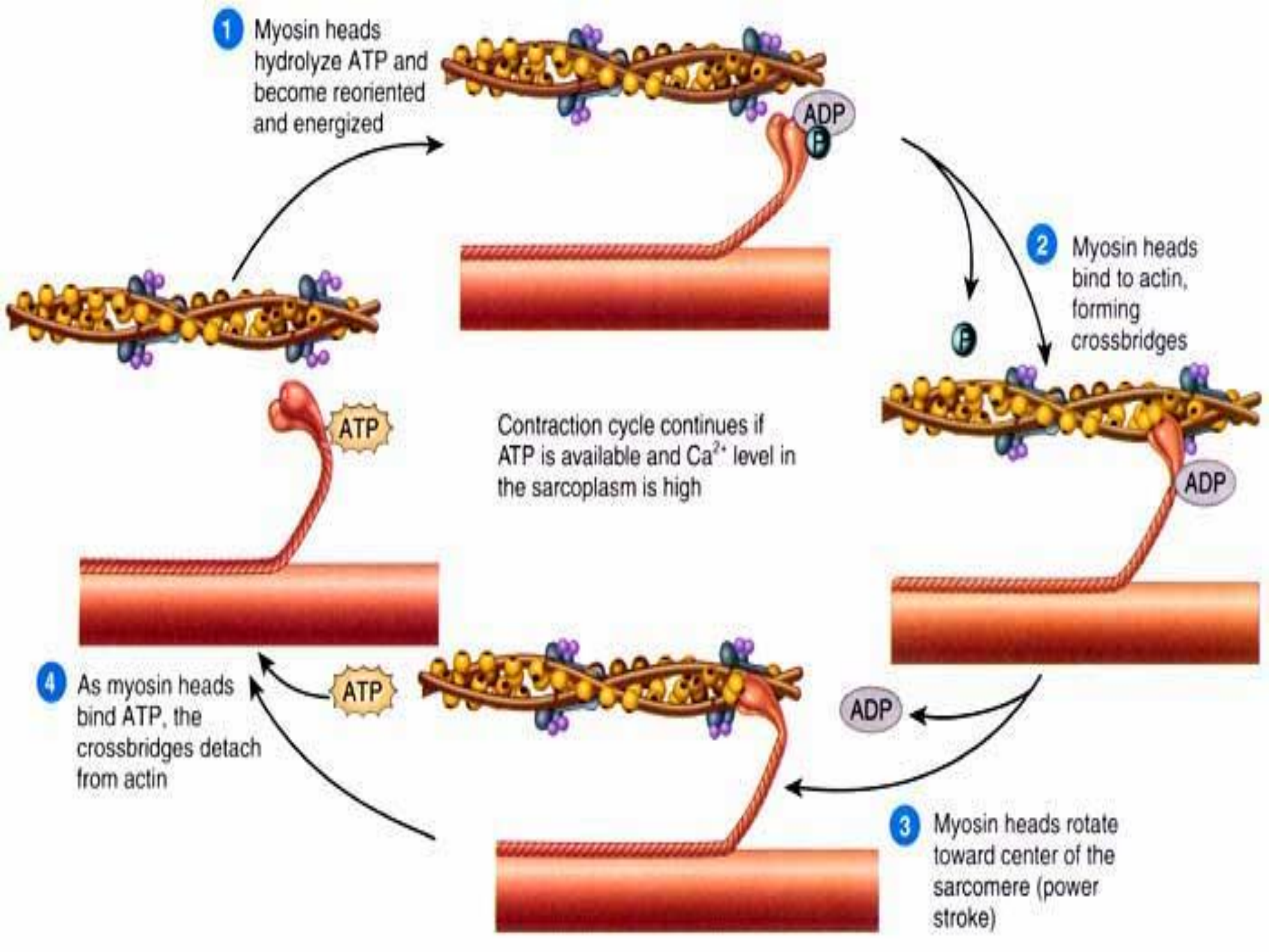
Steps 10 & 11

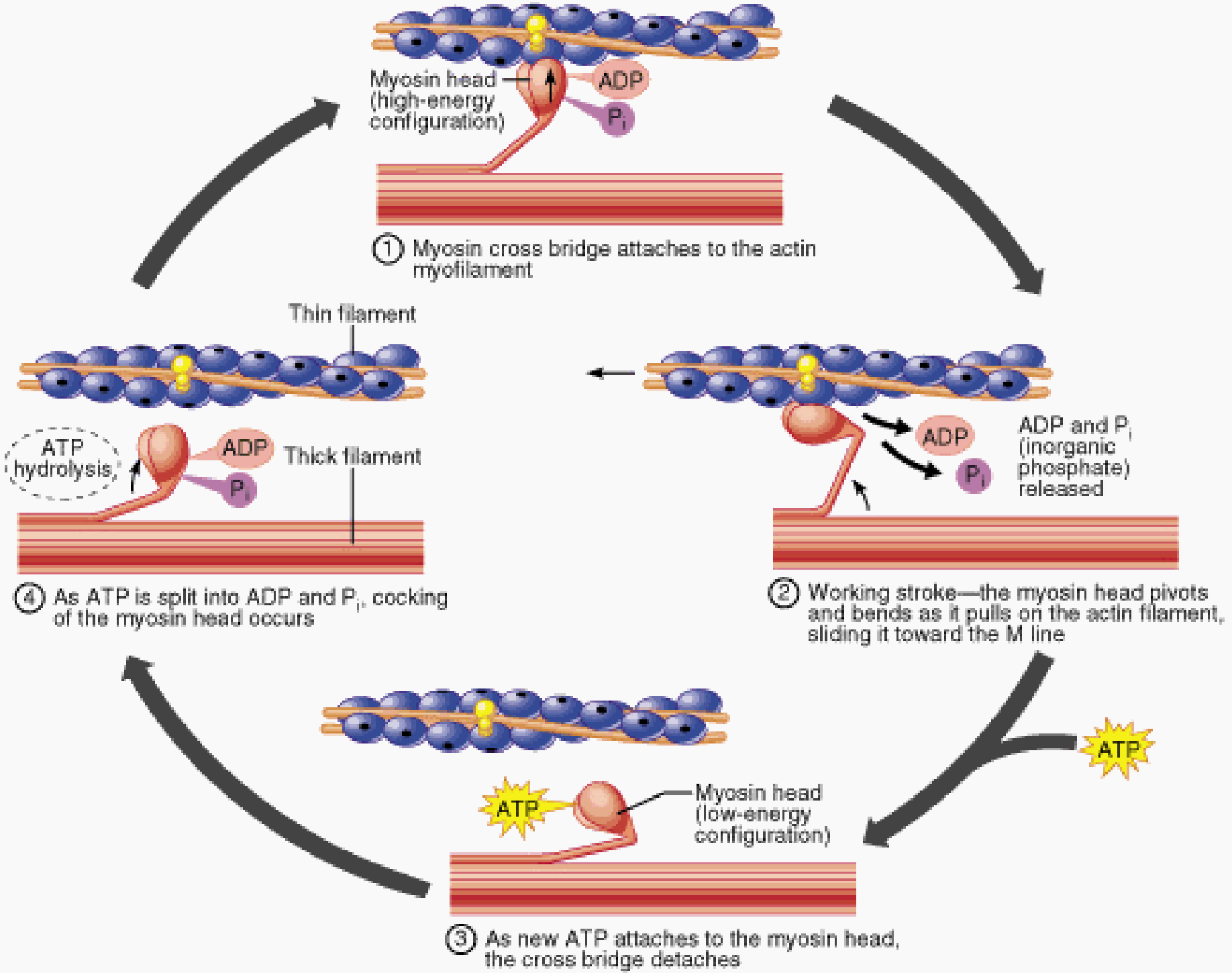
10. Contraction will continue until you decide to stop. As long as calcium is present, contraction will continue.

11. Once you decide to stop the activation, calcium will withdraw into the sarcoplasmic reticulum. Troponin and tropomyosin will cover the binding sites for myosin, and the muscle will return to a resting state.

Watch this!

- http://www.youtube.com/watch?v=EdHzKYDxrKc


1 Myosin heads hydrolyze ATP and become reoriented and energized
ADP
P
2 Myosin heads bind to actin, forming crossbridges
P
ADP
Contraction cycle continues if ATP is available and Ca^{2+} level in the sarcoplasm is high
ATP
4 As myosin heads bind ATP, the crossbridges detach from actin
ATP
ADP
3 Myosin heads rotate toward center of the sarcomere (power stroke)



The Role of ATP: Adenosine Triphosphate

- When the nerve impulse is transmitted to the muscle fiber calcium is released

- Adenosine triphosphate (ATP) is the energy source that allows for the calcium to be released