Sliding Filament Theory

The sliding filament theory explains muscle contraction based on how muscle fibers (actin and myosin) slide against each other to generate tension in the overall muscle.

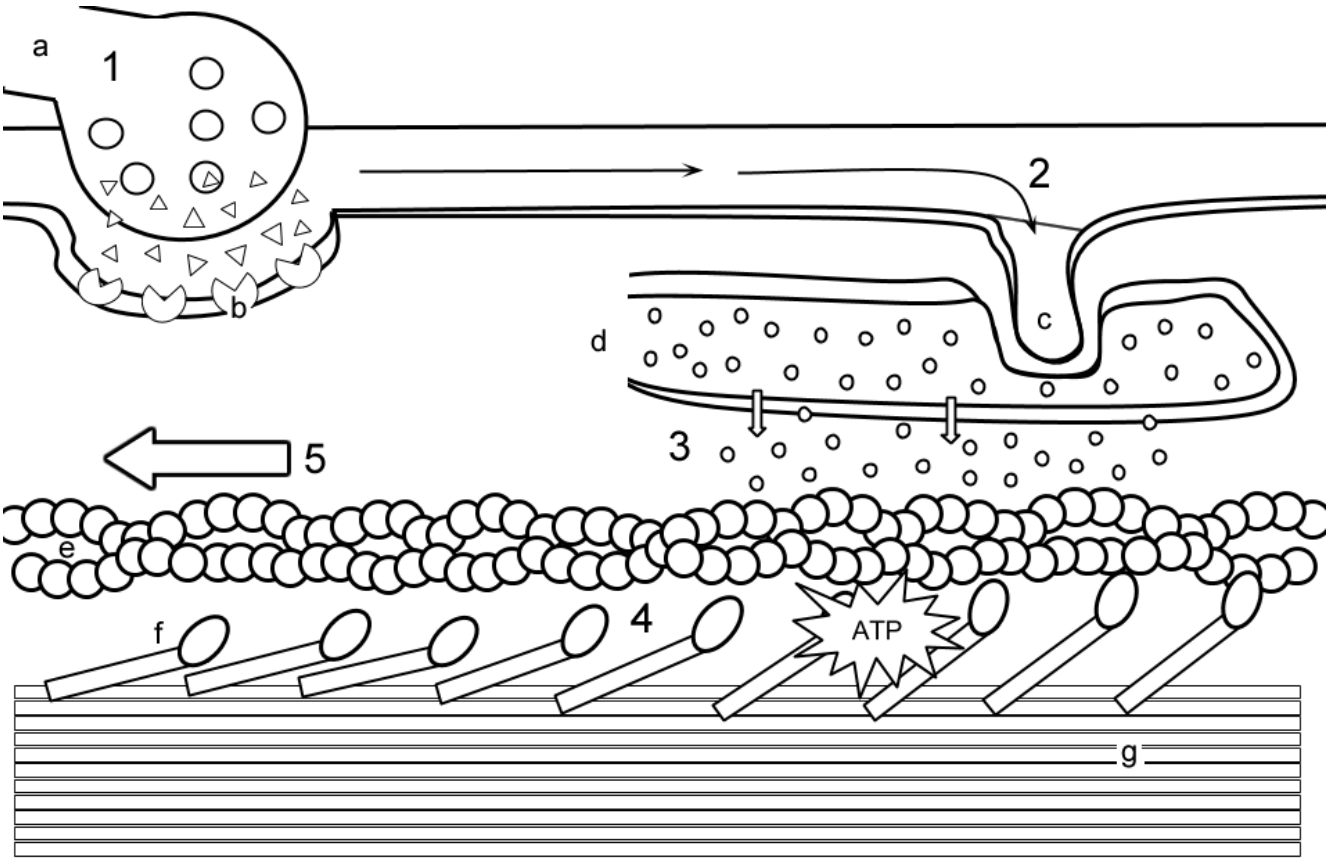
Step 1: A muscle contraction starts in the brain, where signals are sent along the motor neuron (a). Color the motor neuron yellow❑. Within the motor neuron are vesicles that contain the neurotransmitter, acetylcholine. Color vesicles gray❑ and the triangles that represent the acetylcholine orange❑. Acetylcholine reaches the receptors (b) on the muscle sarcolemma which causes an impulse.

Step 2: The impulse travels down the membrane and into the transverse tubules (c) where it causes calcium to be released from the sarcoplasmic reticulum. Color the t-tubule green❑ and the circles that represent calcium dark blue❑. The sarcoplasmic reticulum is only partially pictured, shade this structure pink❑.

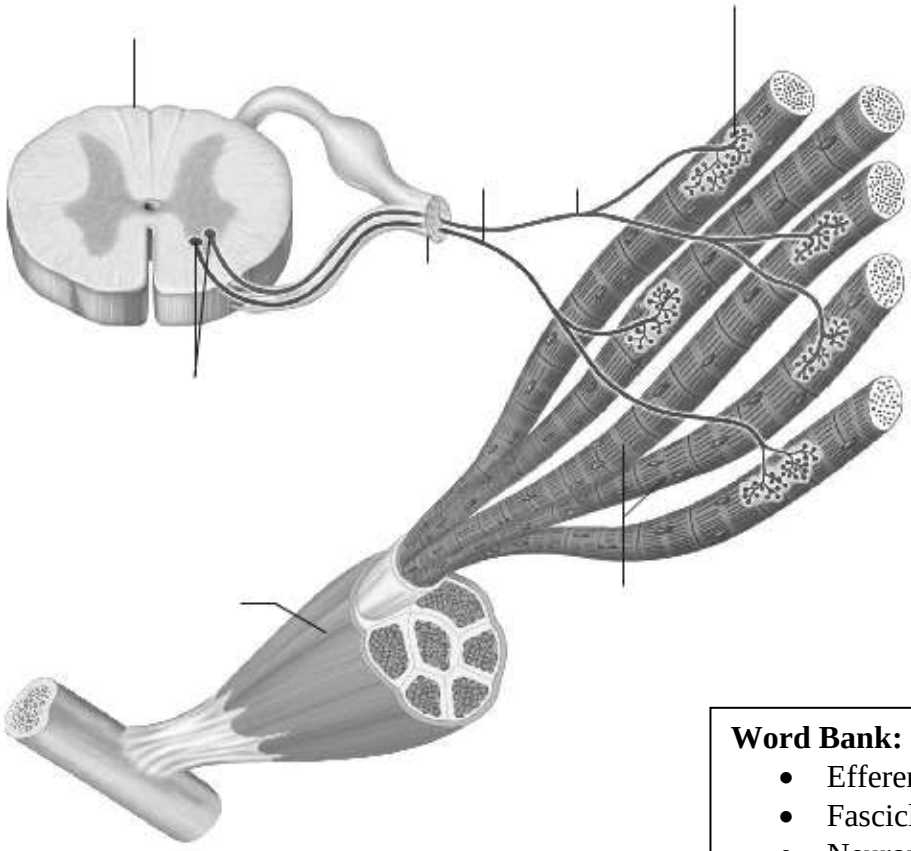
Step 3: Calcium binds to a structure on the actin that causes it to change shape. Color the actin myofilament (e) red❑.

Step 4: The change in shape allows myosin heads to form cross-bridges between the actin and the myosin. Color the myosin (g) blue❑. Color the cross bridges (f) purple❑.

Step 5: Energy from ATP is used to create a "power stroke" between the two filaments. Color the ATP bright orange❑. The actin filament then slides inward and shortens, or contracts, the whole muscle.

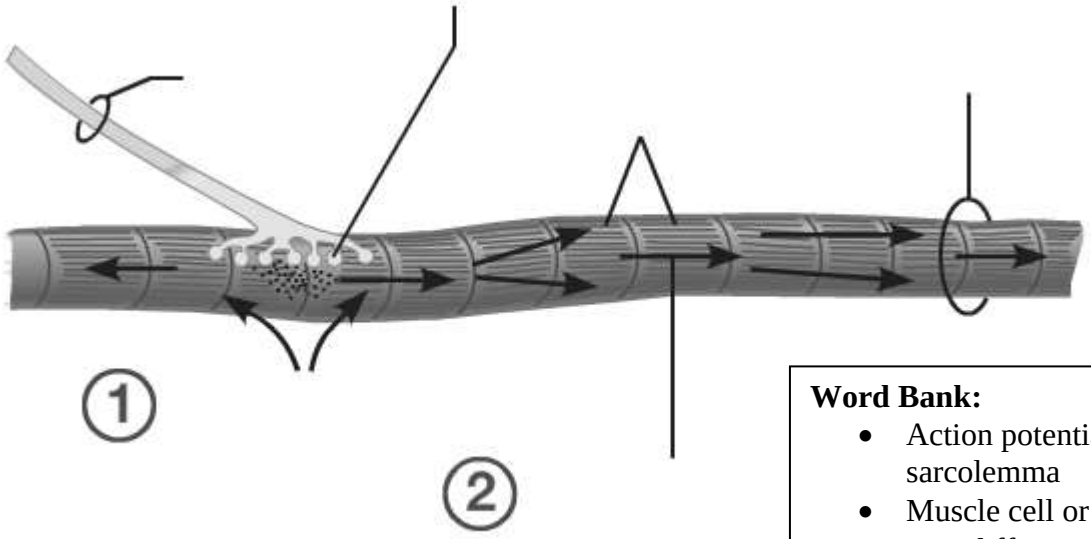


Label the 2 picture below using the associated word banks.



Word Bank:

- Efferent (Motor) Nerve (x2)
- Fascicle
- Neuromuscular junction
- Skeletal Muscle
- Soma
- Spinal Cord
- Ventral Root



Word Bank:

- Action potential spreads along sarcolemma
- Muscle cell or fiber
- Na+ diffuses into cell
- Nerve fiber
- Neuromuscular junction