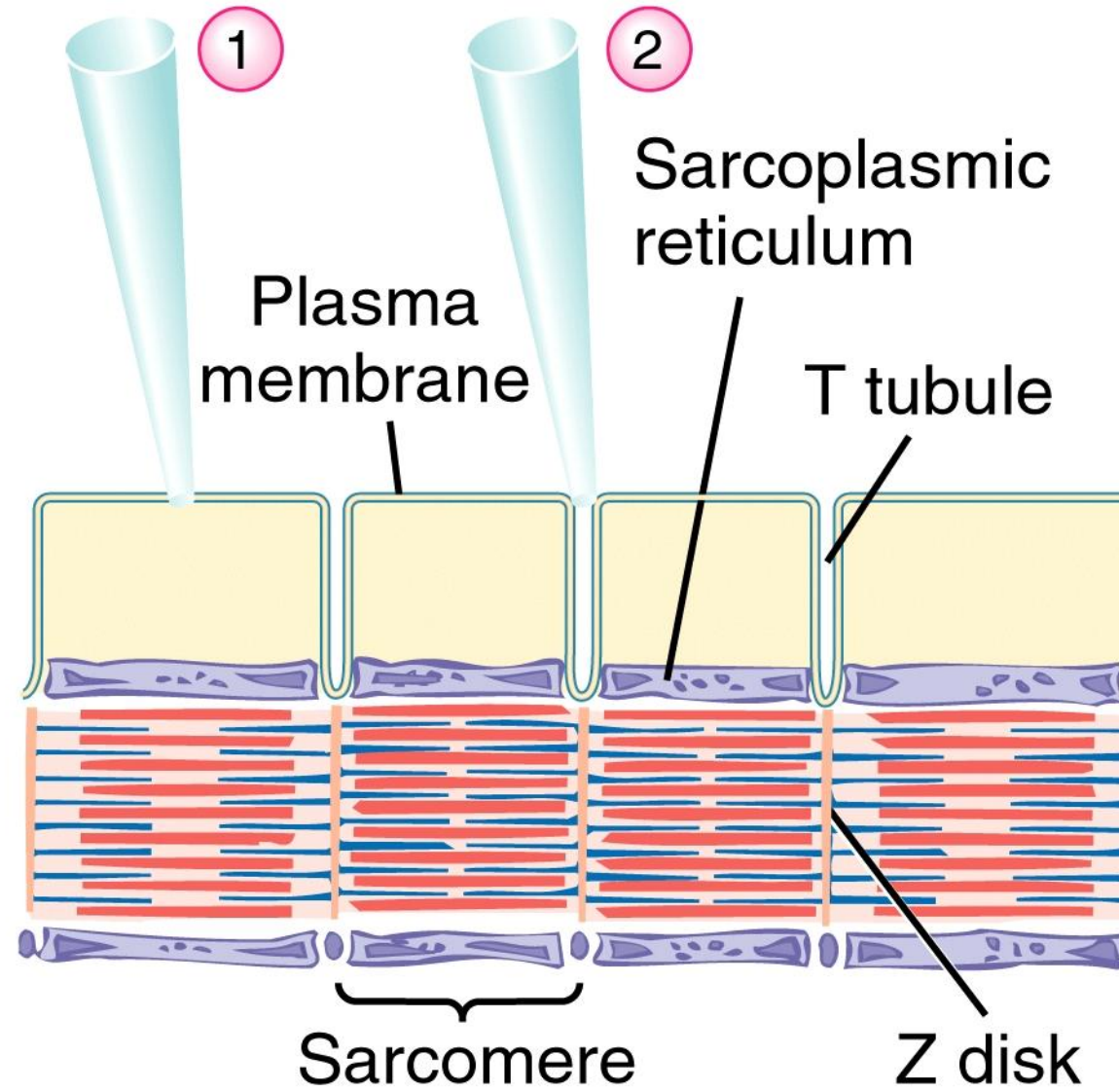
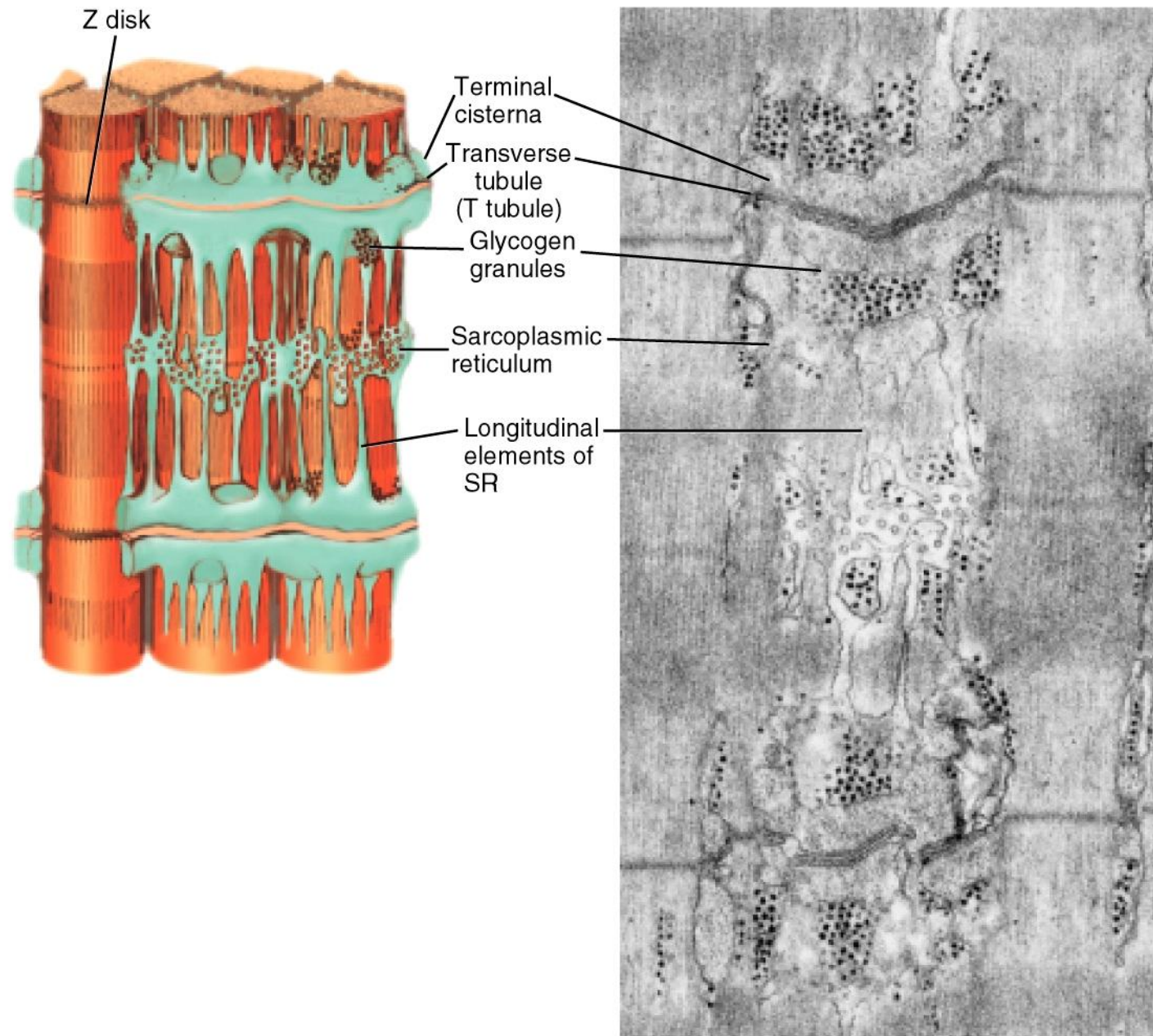
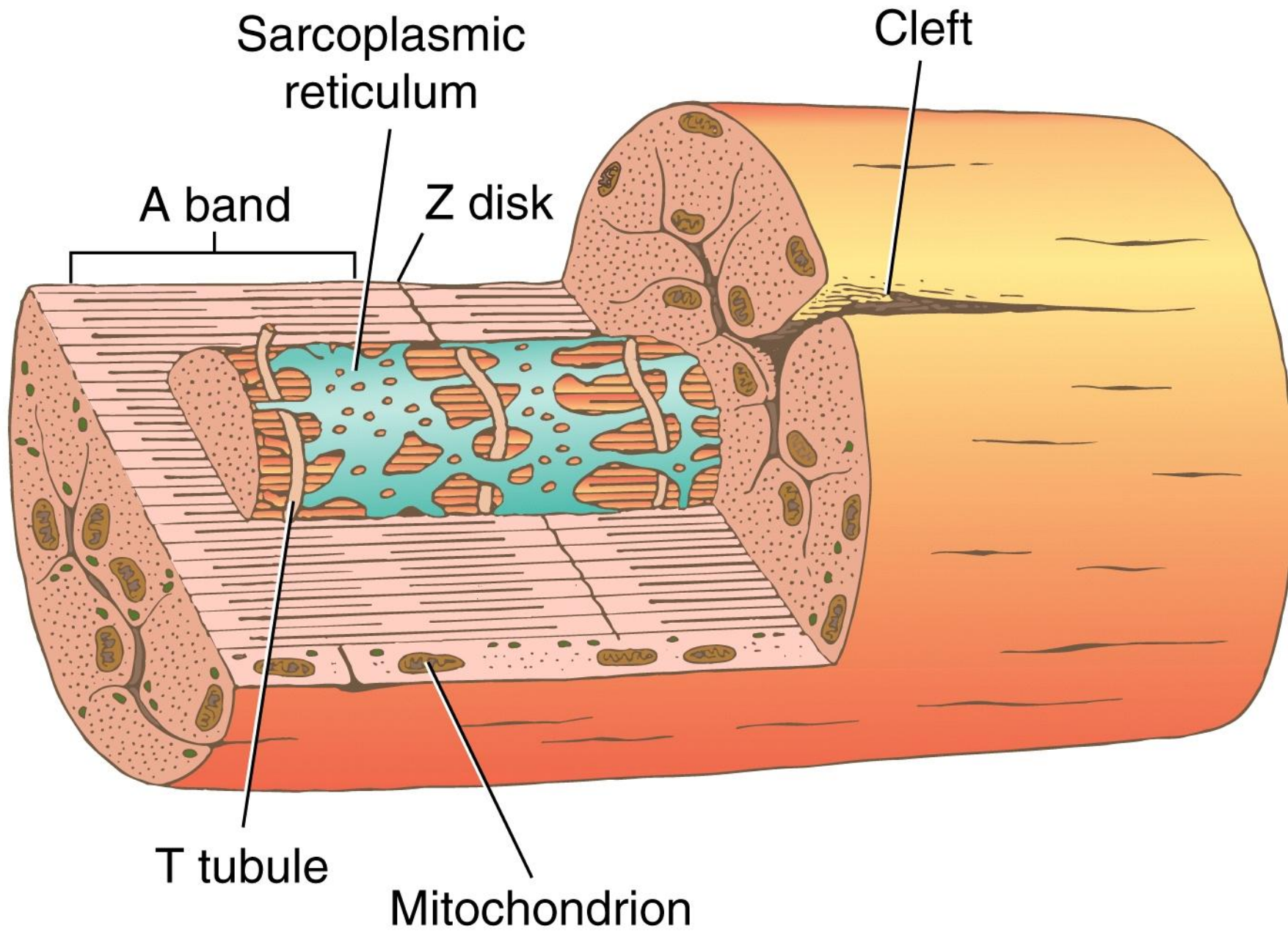


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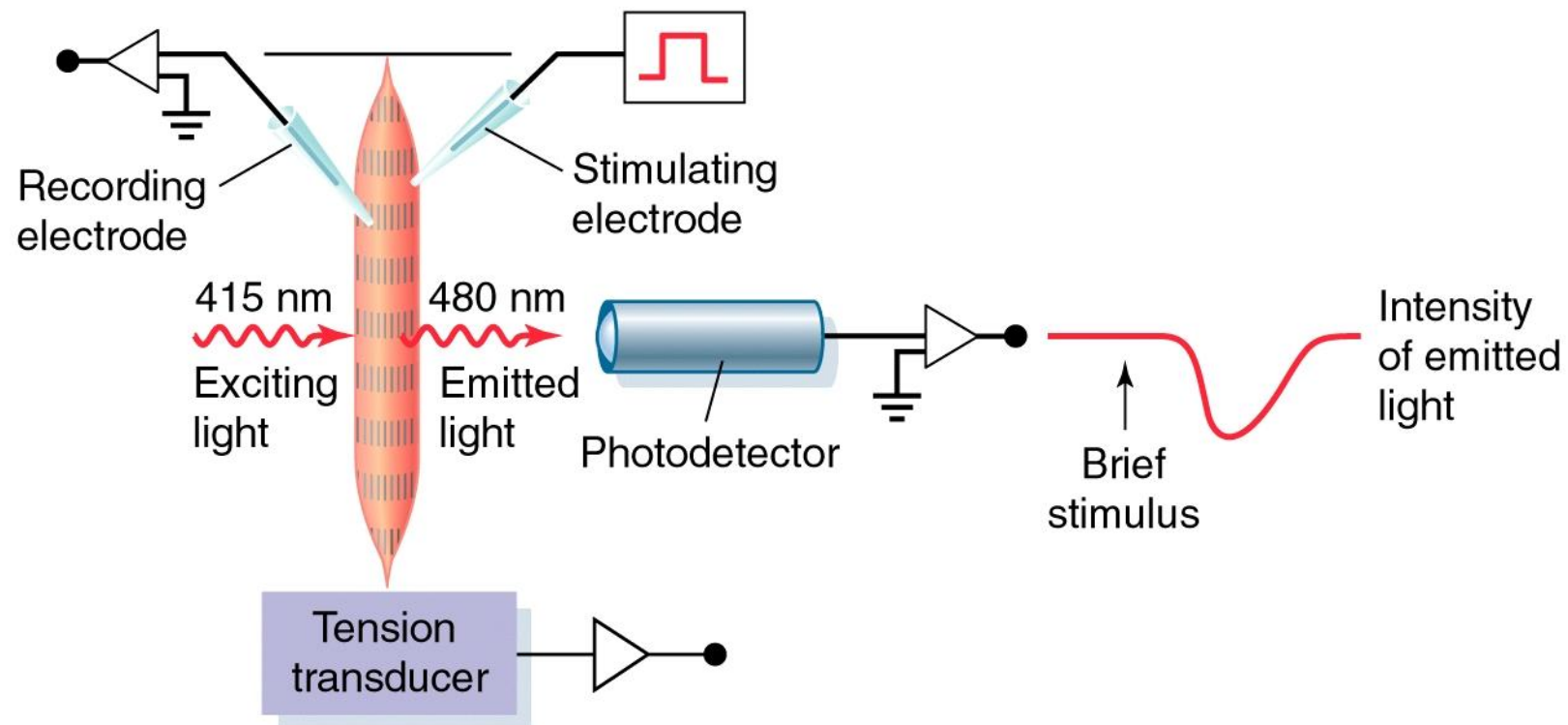
(b)



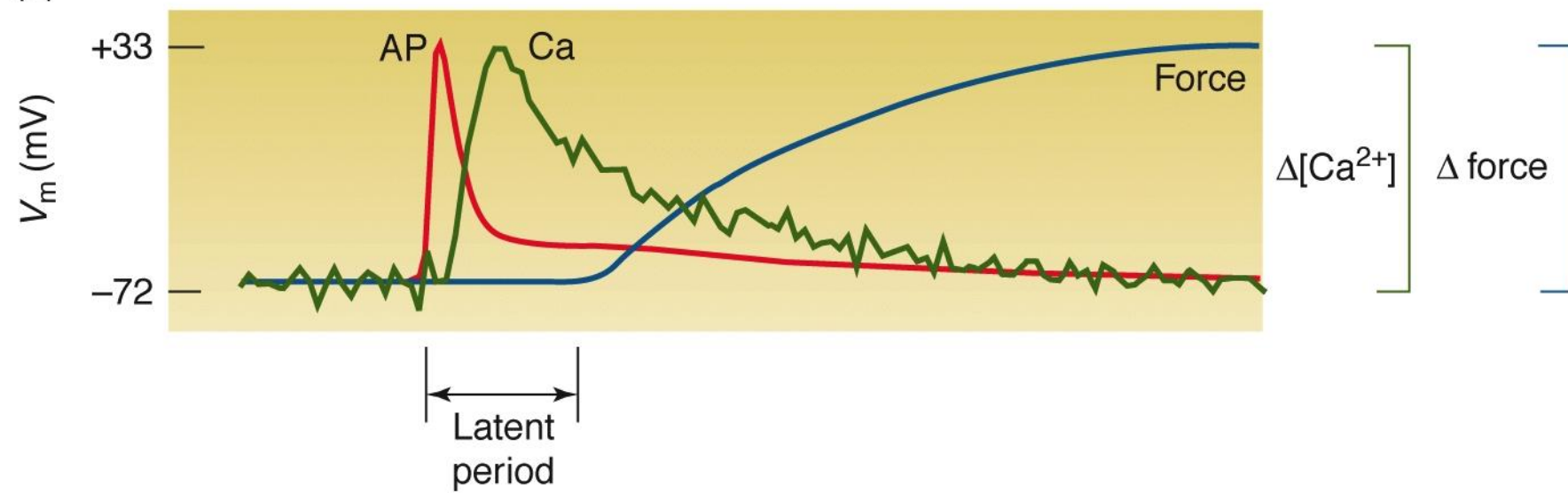




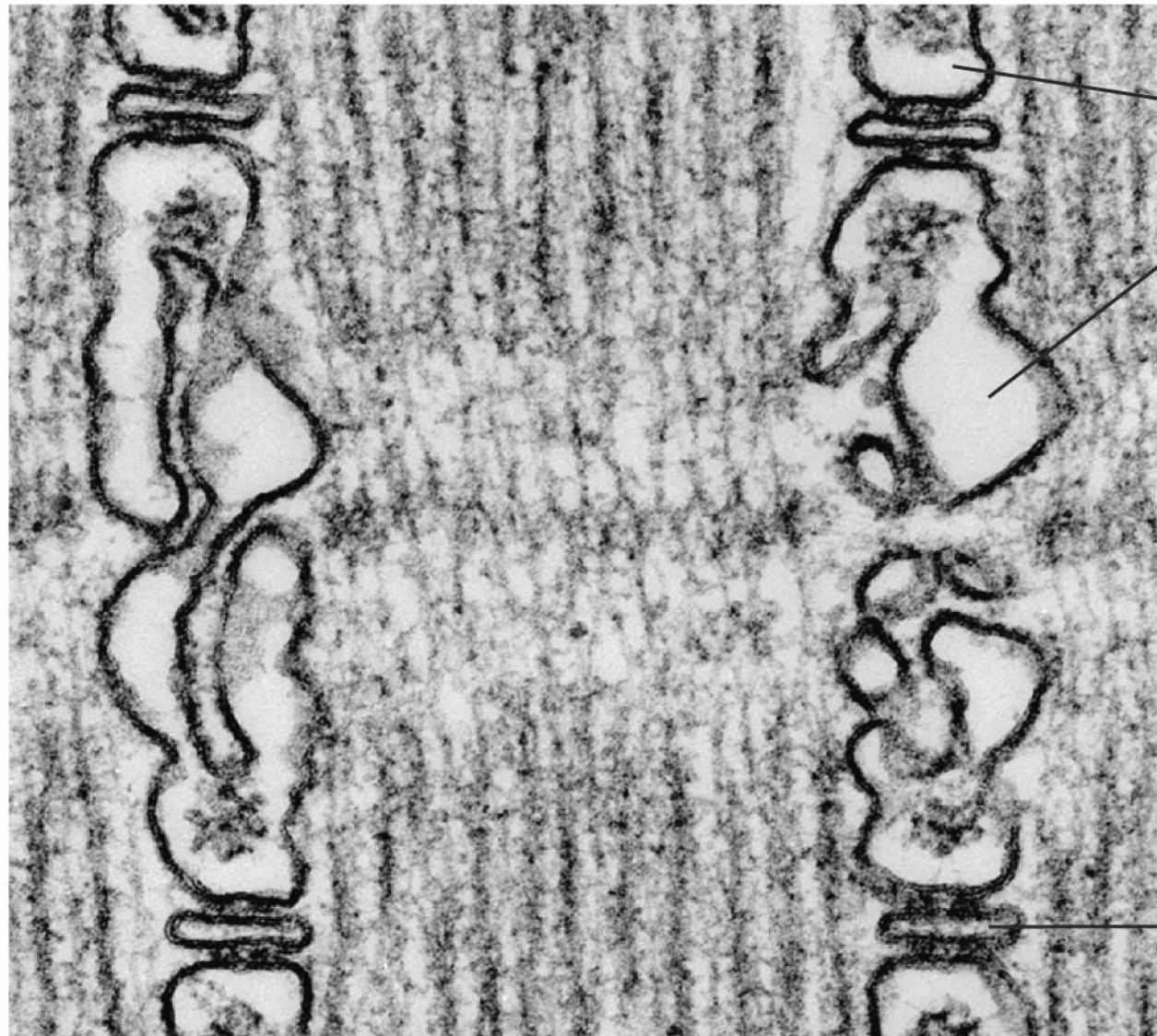
(a)



(b)



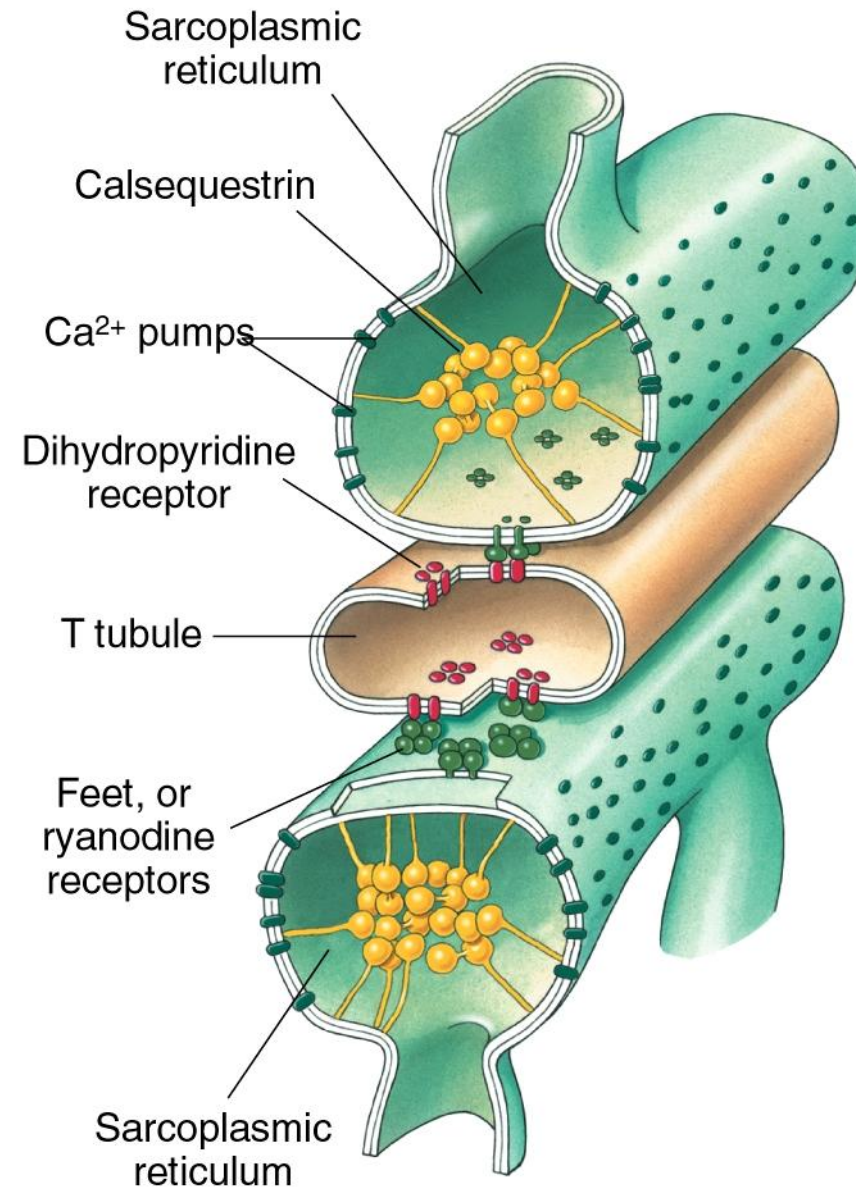
(a)

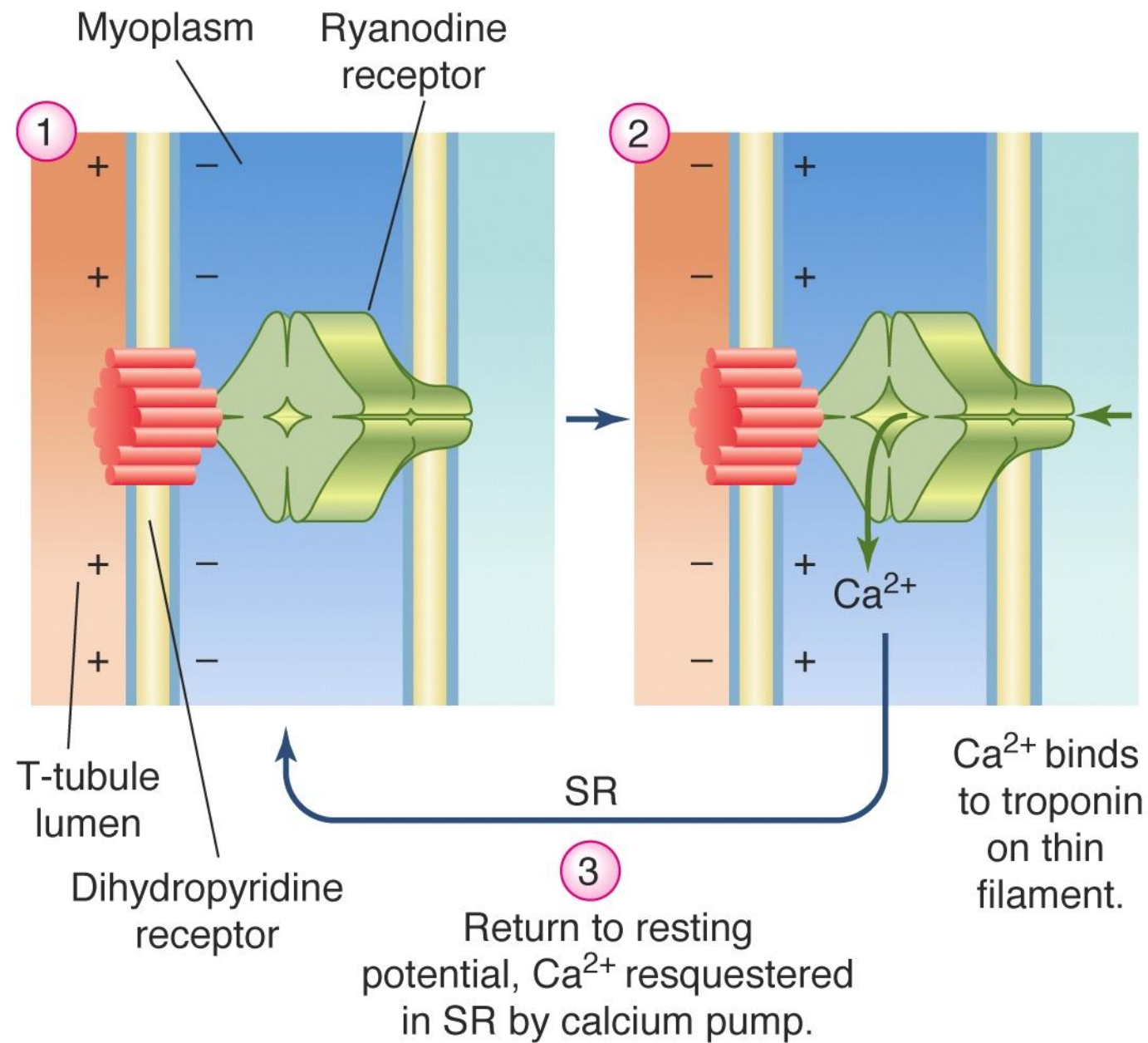


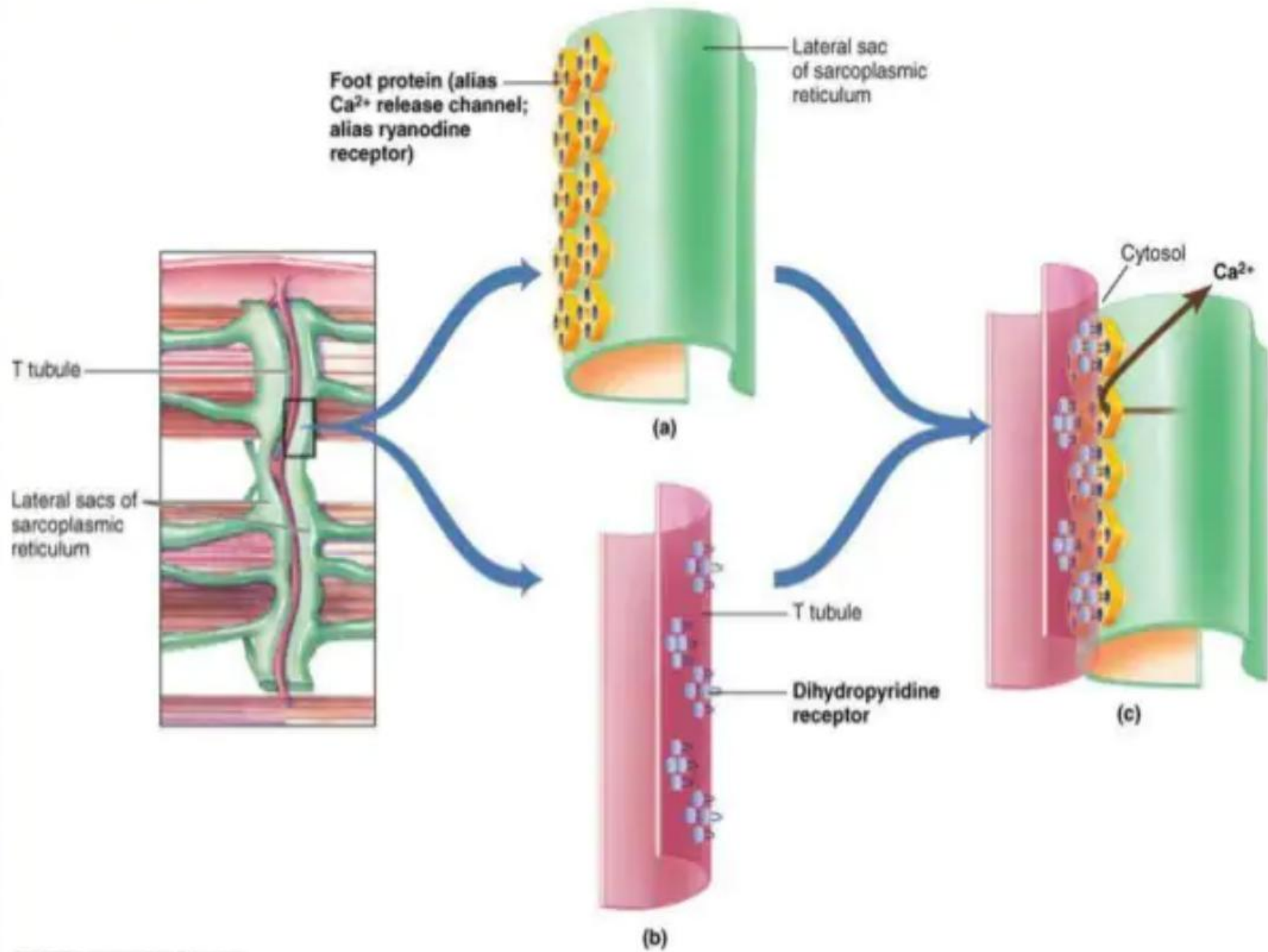
Terminal
cisternae

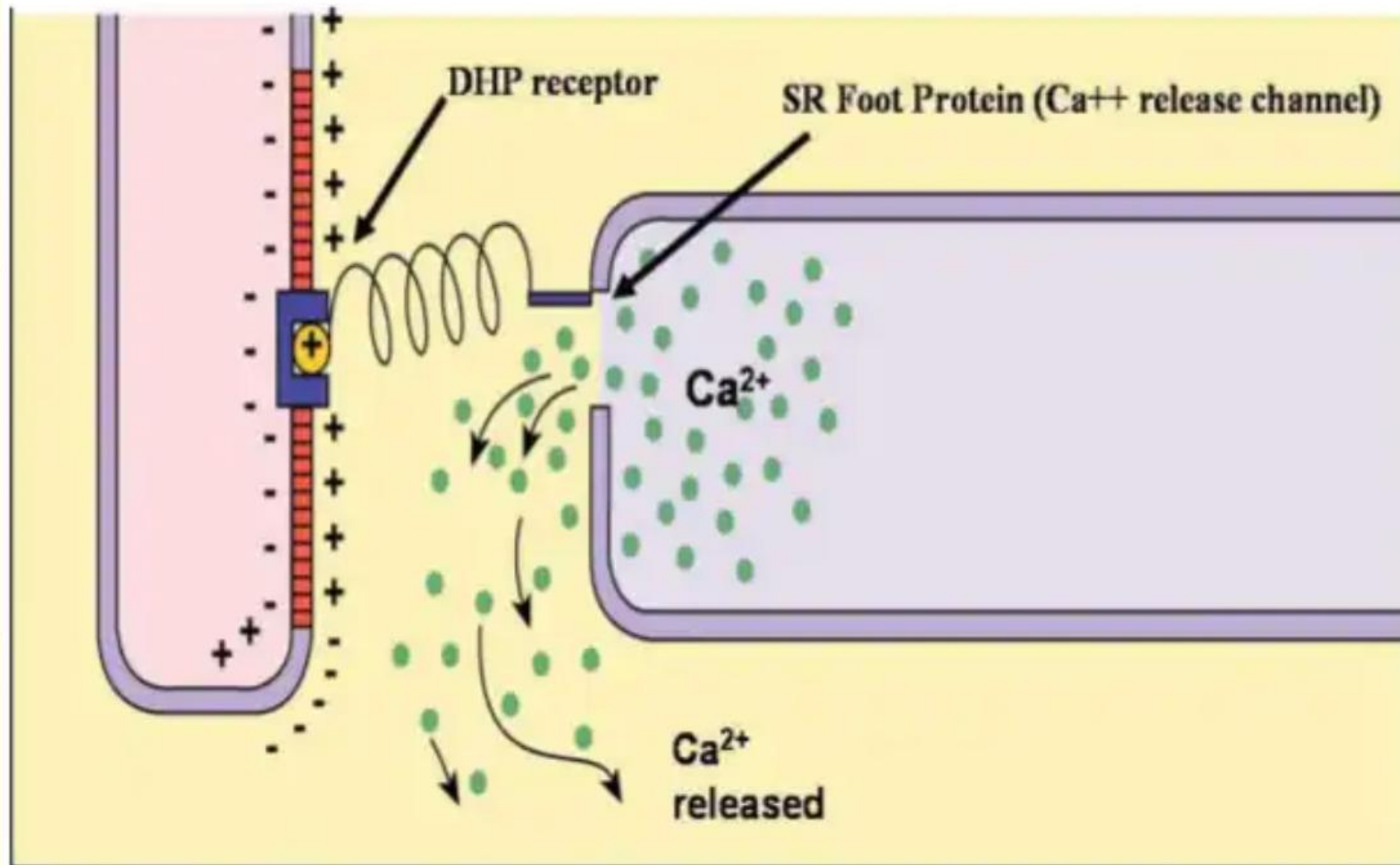
T tubule

(d)



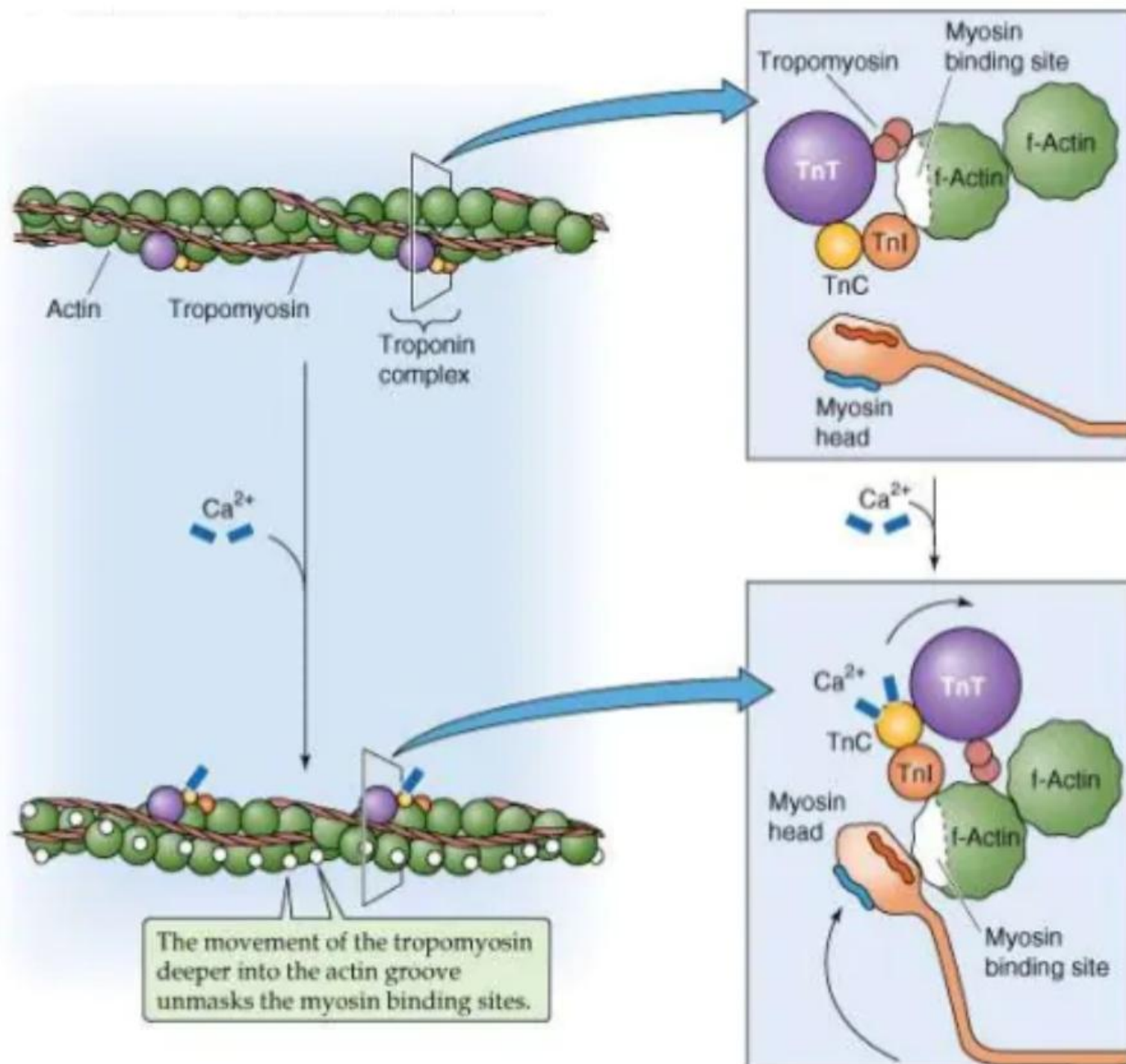






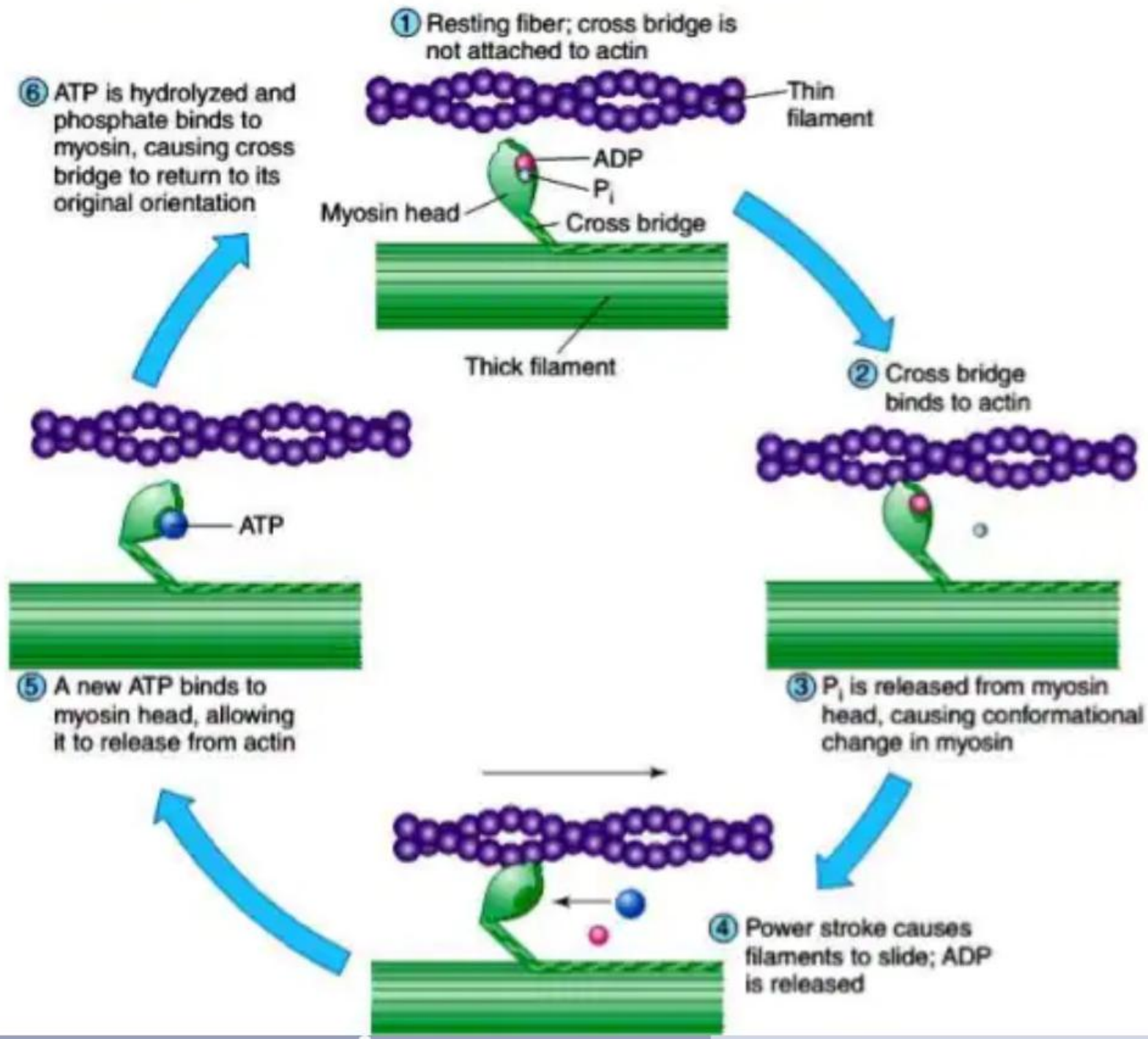
Excitation Contraction(EC) coupling

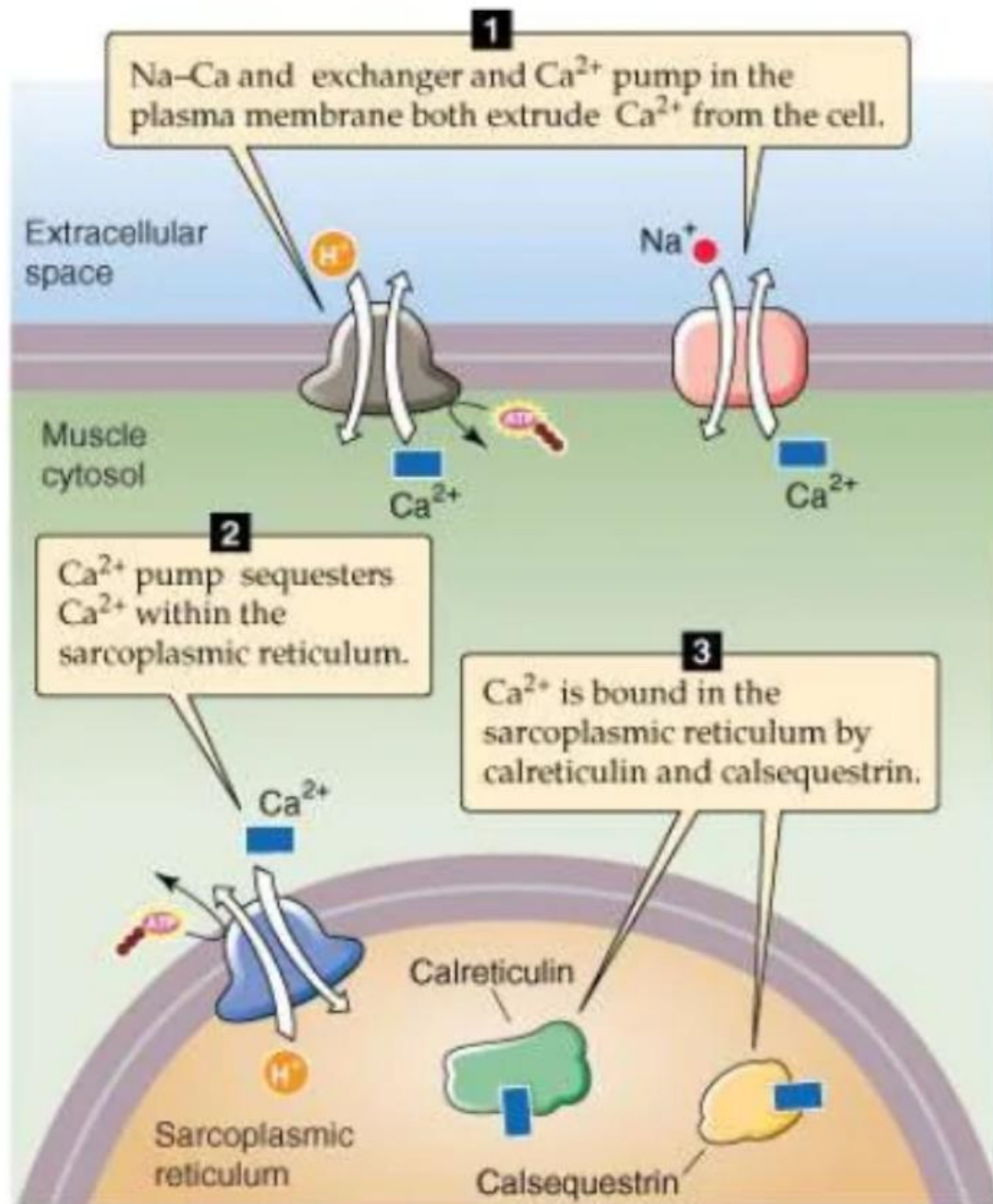
- Ca^{++} binds with Troponin C
- Troponin – Tropomyosin complex inhibits the interaction between actin and myosin
- When Ca^{++} binds to Trop C, active sites of actin are uncovered & ATP is split to ADP releasing P- energy & contraction occurs

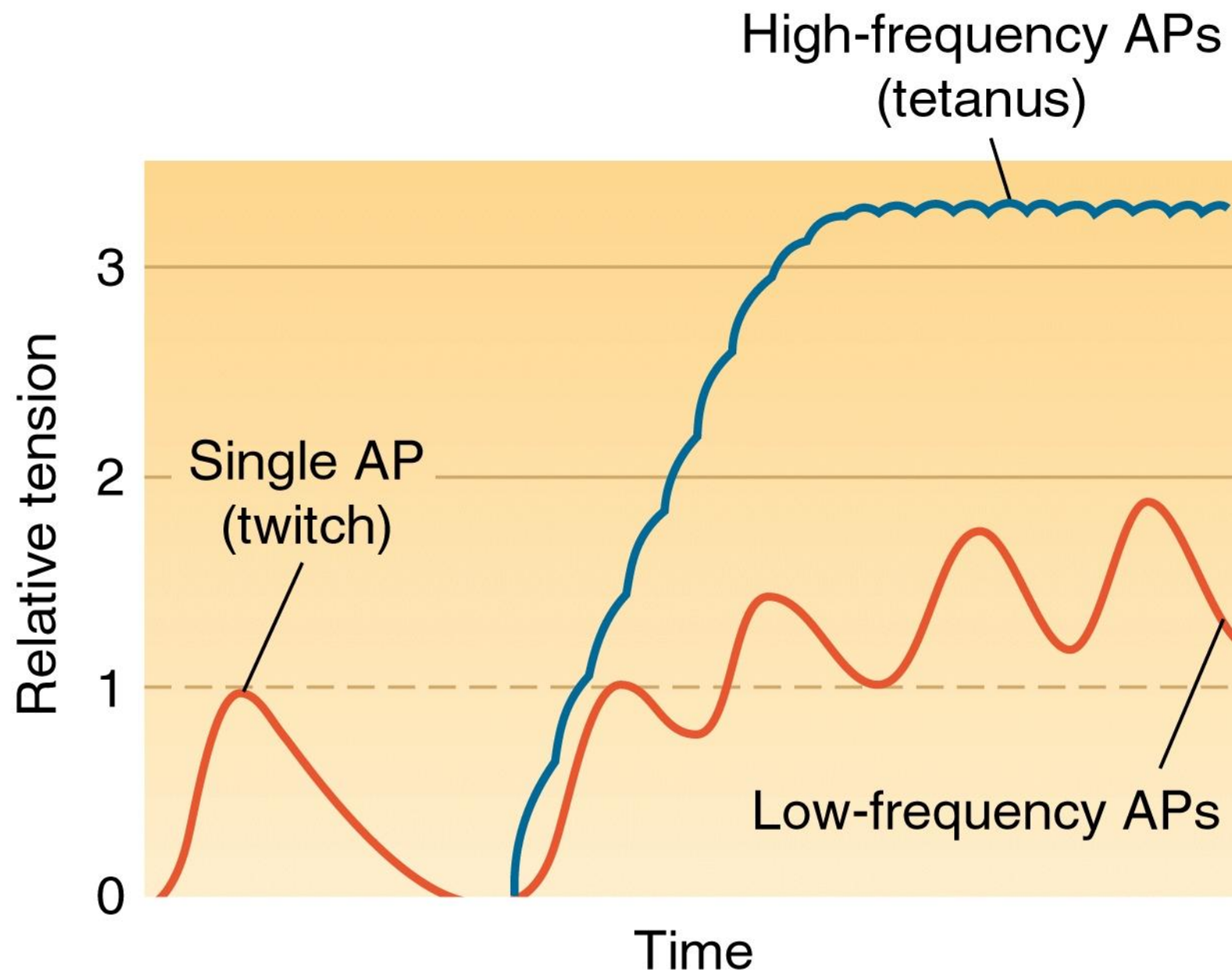


Cross Bridge Cycle

- ❑ In presence of calcium, myosin head binds to an actin filament
- ❑ Changes its orientation relative to myosin filament which causes filaments to slide relative to each other - **Power Stroke**
- ❑ During the Cross-Bridge Cycle, Contractile Proteins Convert the Energy of ATP Hydrolysis Into Mechanical Energy
- ❑ Each power stroke shortens sarcomere by **10nm**
- ❑ Cross bridge cycling is asynchronous
 - 500 myosin in one thick filament, each head cycling 5 times per second







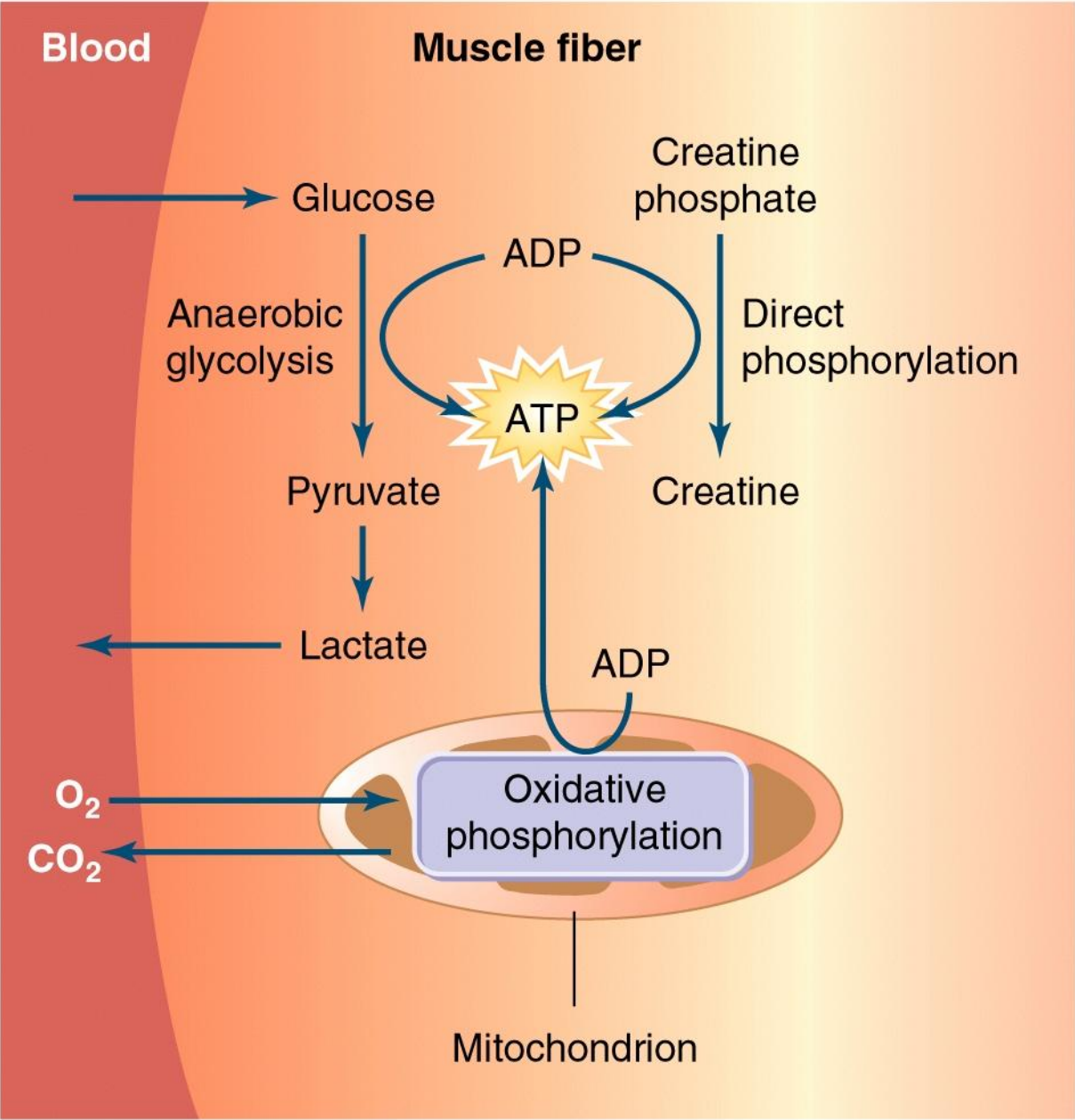
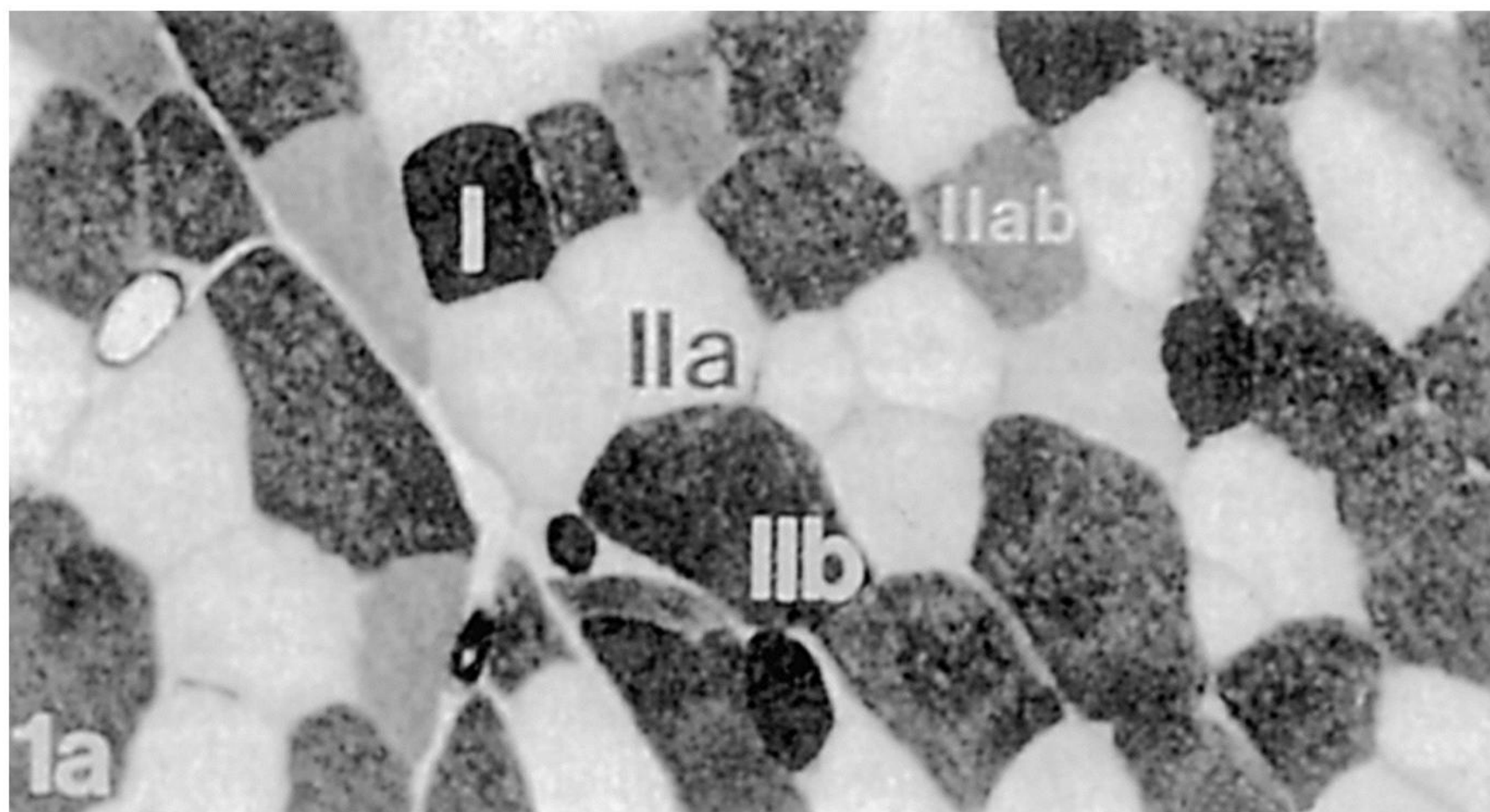
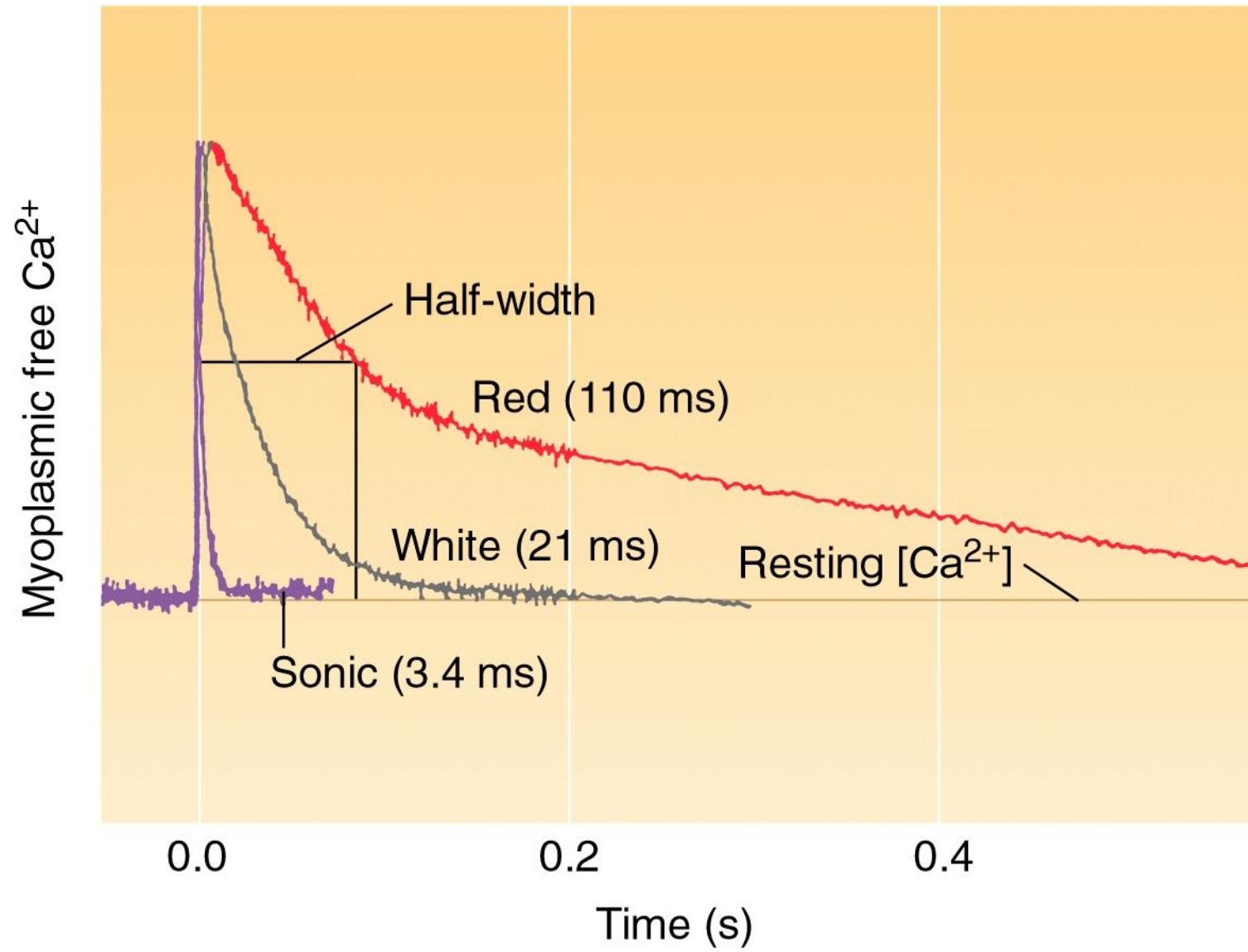


Table 10-1 Properties of twitch (phasic) fibers in mammalian skeletal muscles

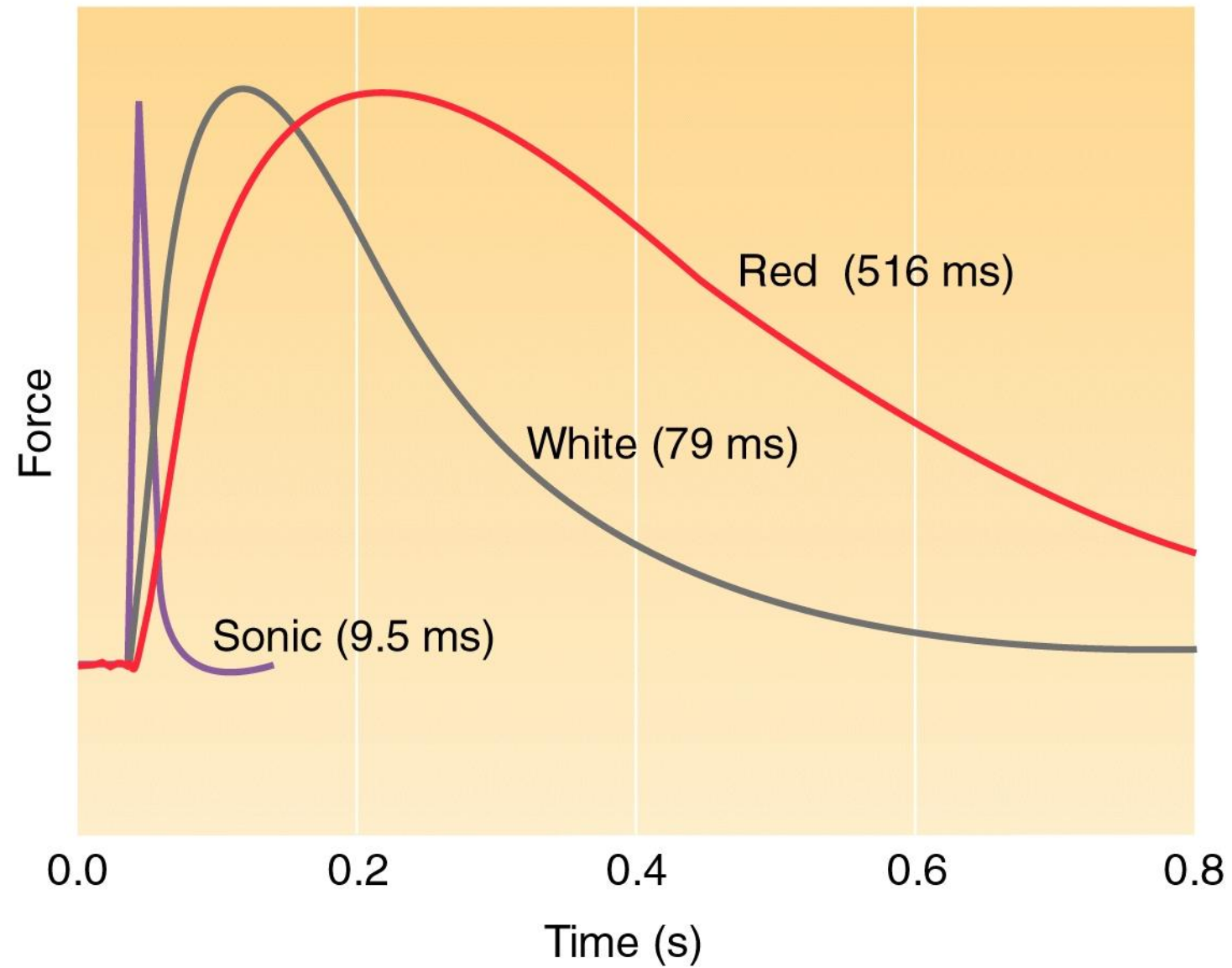
Property	Slow oxidative (type I)	Fast oxidative (type IIa)	Fast glycolytic (type IIb)
Fiber diameter	↓	↔	↑
Force per cross-sectional area	↓	↔	↑
Rate of contraction ($V_{\max}$)	↓	↑	↑
Myosin ATPase activity	↓	↑	↑
Resistance to fatigue	↑	↔	↓
Number of mitochondria	↑	↑	↓
Capacity for oxidative phosphorylation	↑	↑	↓
Enzymes for anaerobic glycolysis	↓	↔	↑
<i>Source:</i> Adapted from Sherwood, 2001. Key = ↓ Low ↔ Intermediate ↑ High			

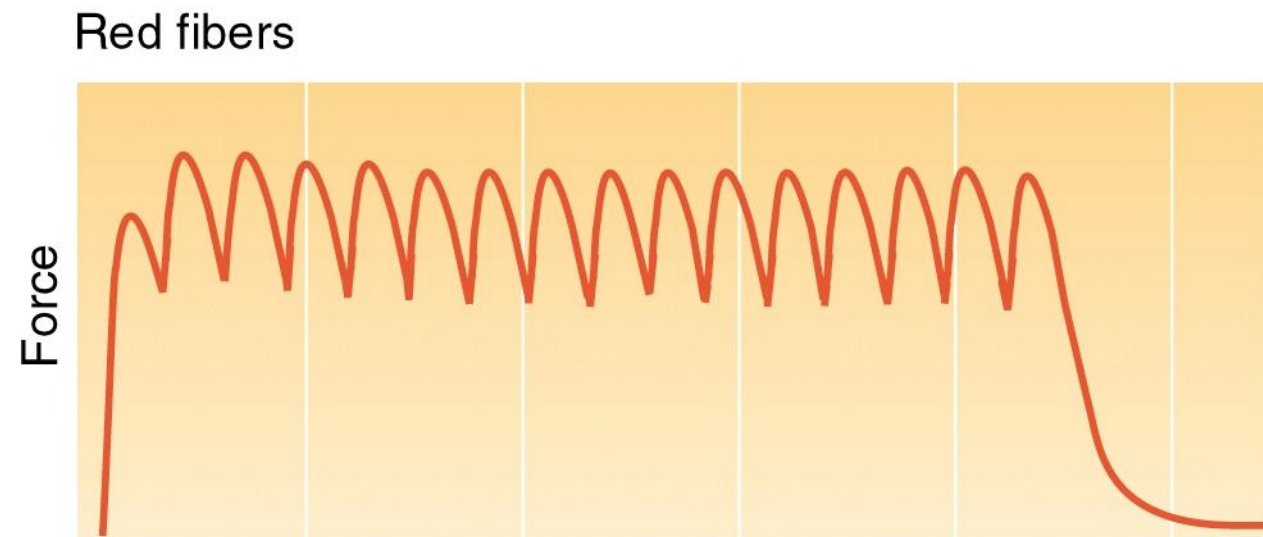
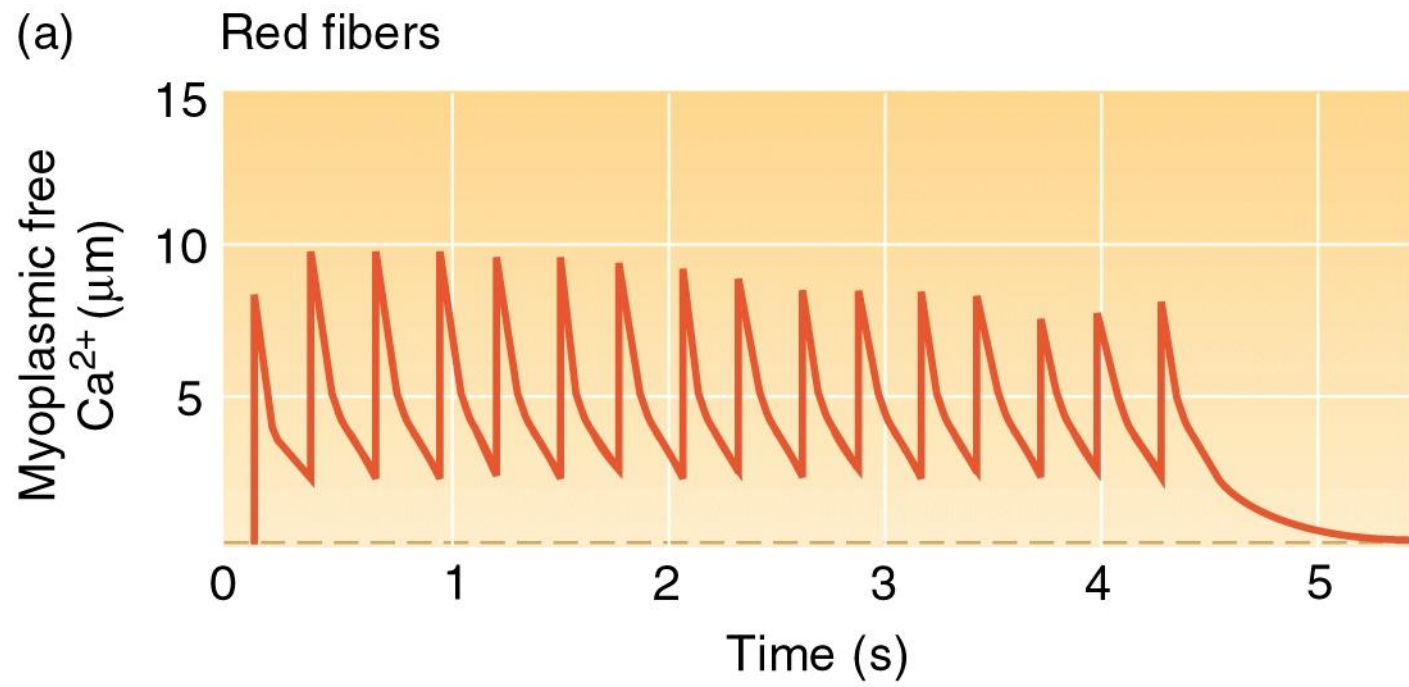


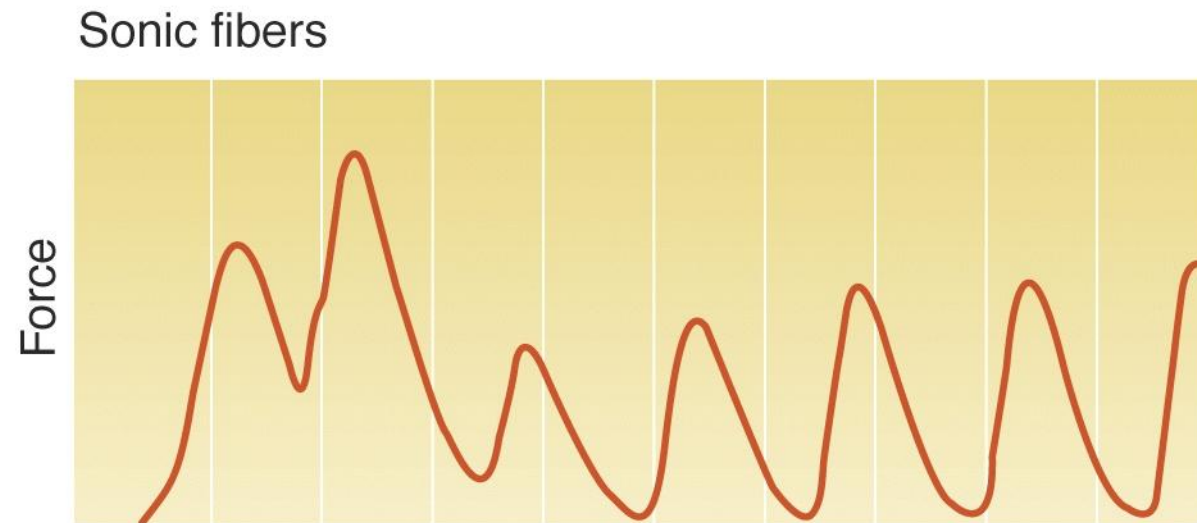
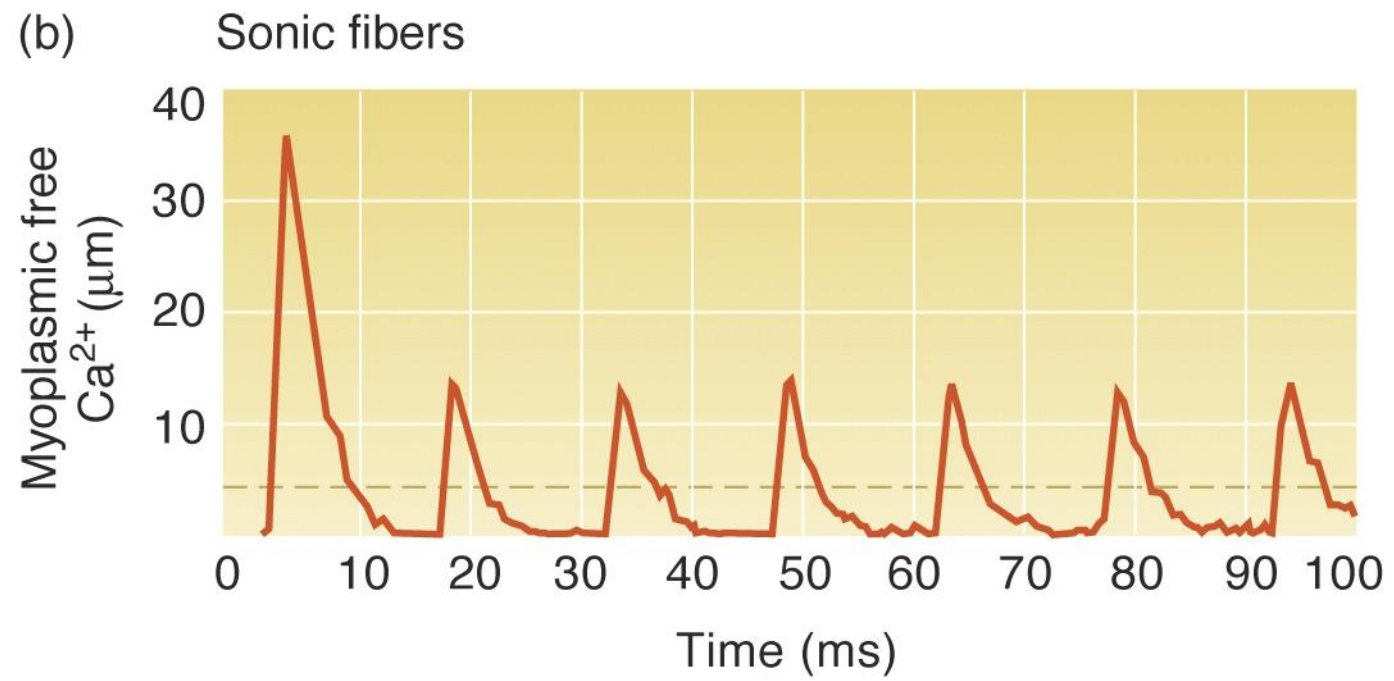
(a) Ca^{2+} concentration over time

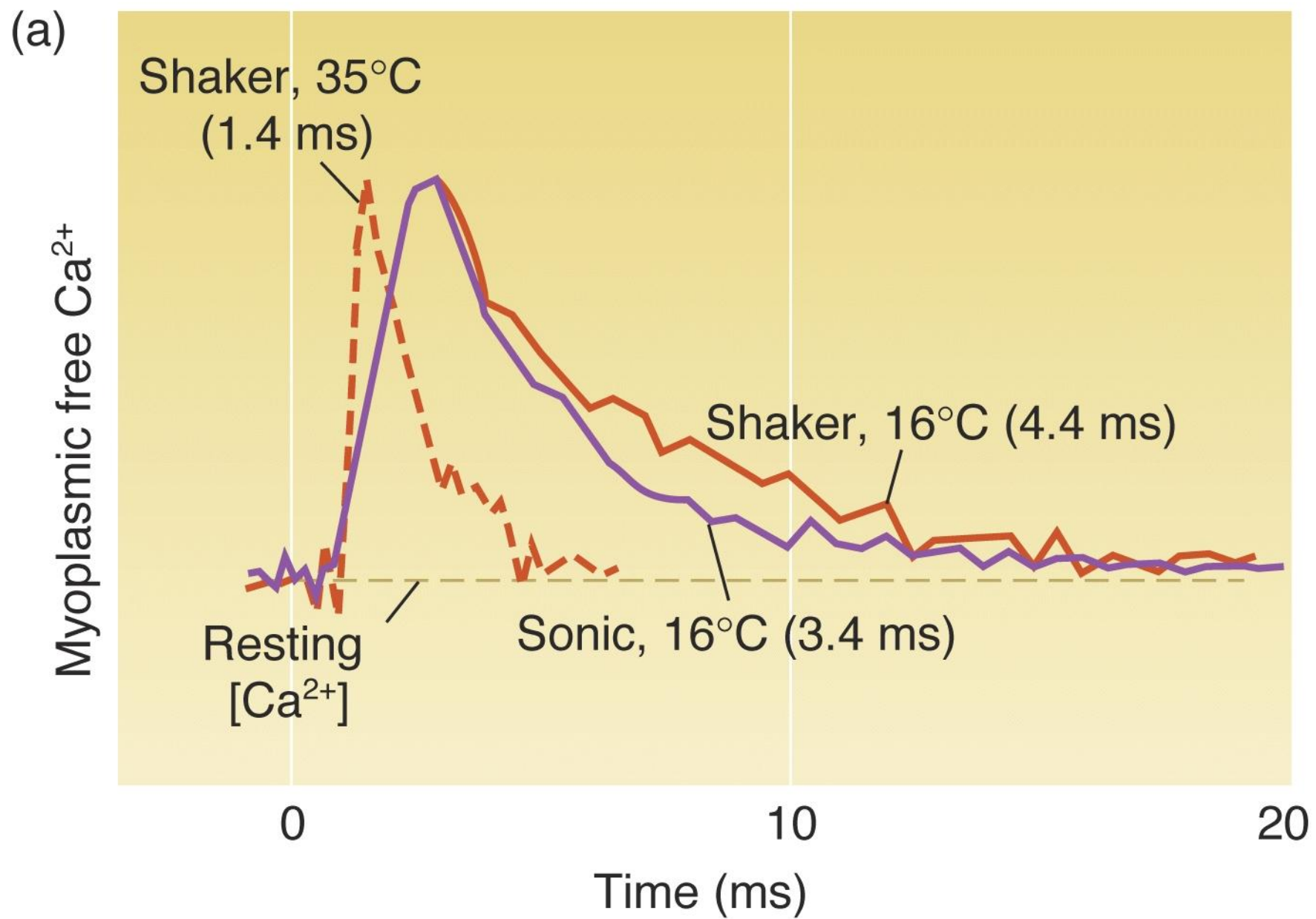


(b) Twitch tension over time

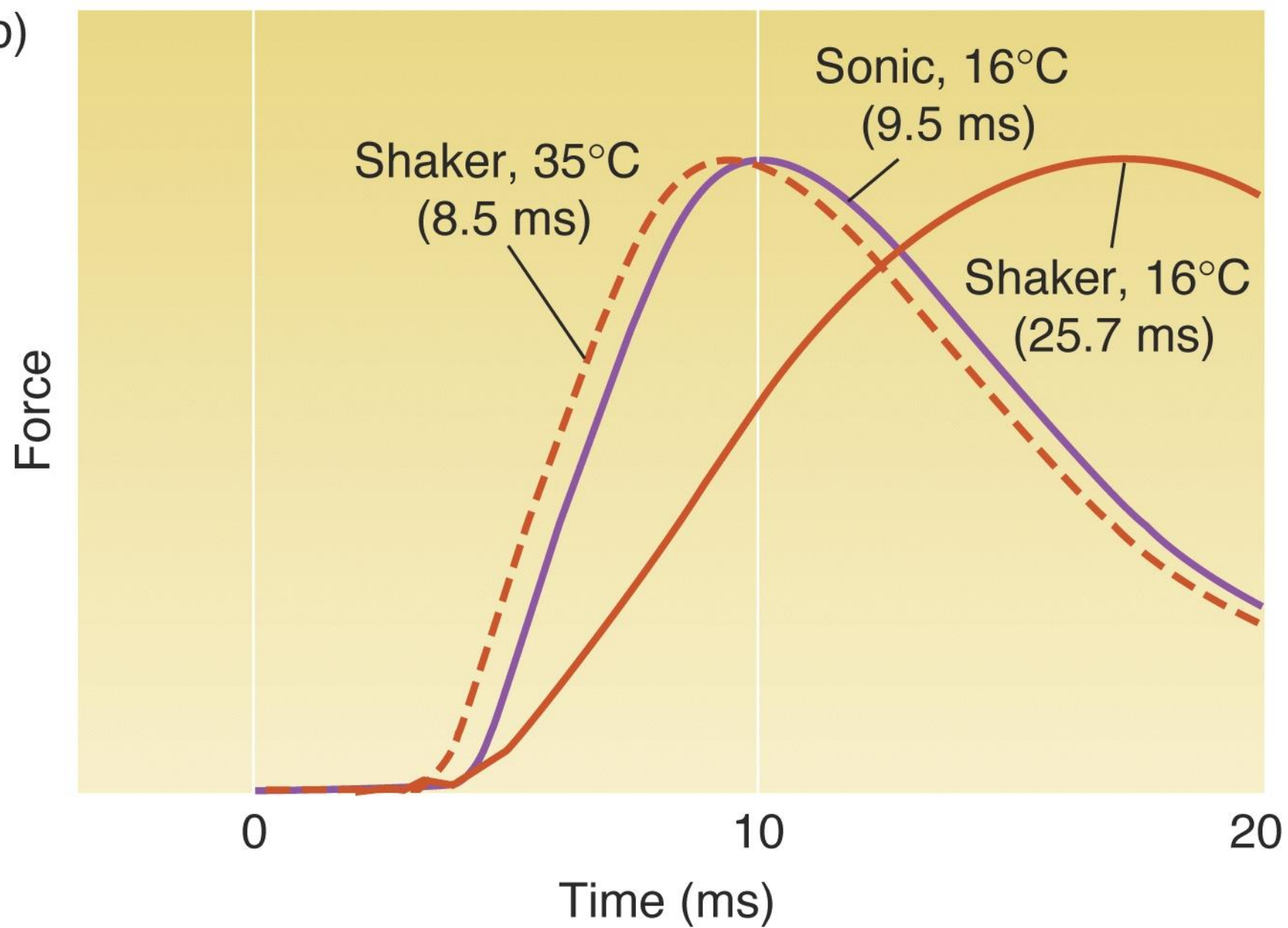








(b)



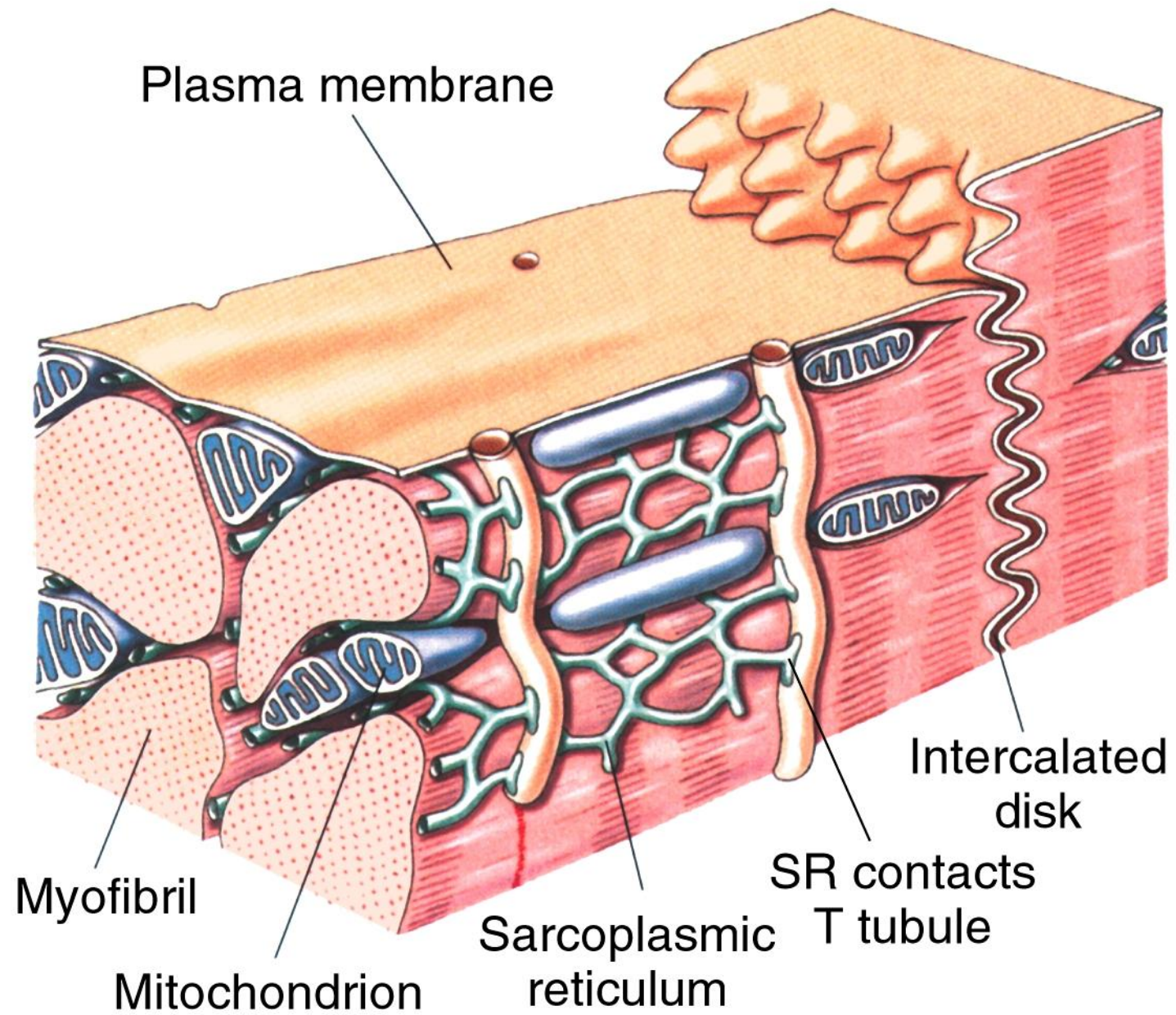


Table 10-2 Characteristics of the major types of muscle fibers in vertebrates

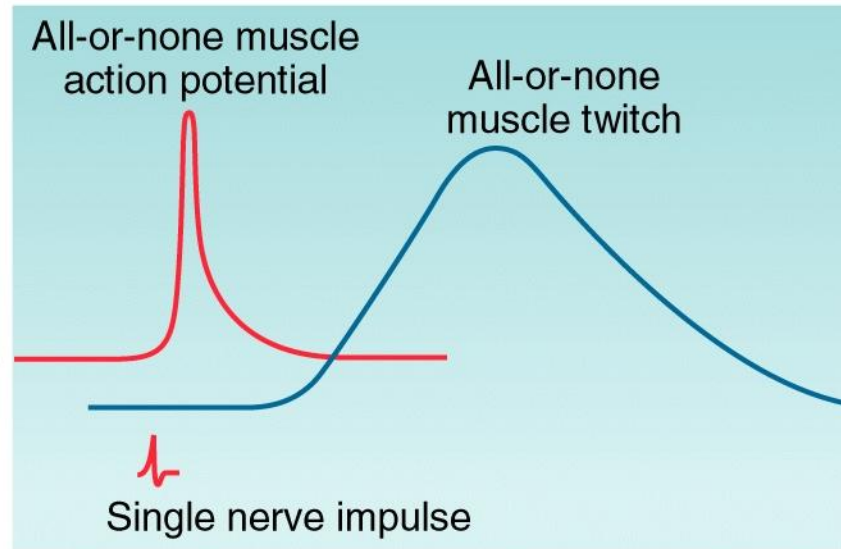
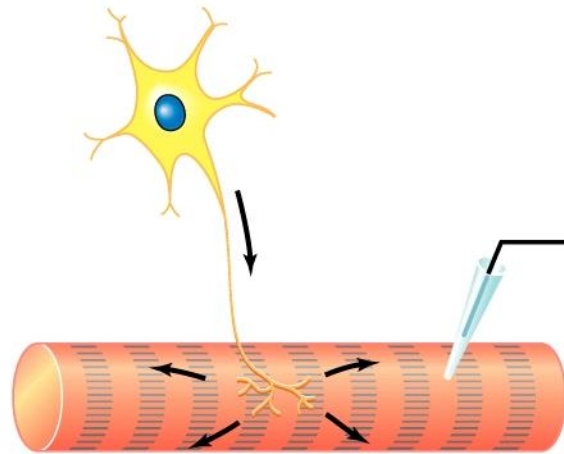
Property/component	Striated muscle	
	Skeletal	Cardiac
Visible banding pattern	Yes	Yes
Myosin thick filaments and actin thin filaments	Yes	Yes
Tropomyosin and troponin	Yes	Yes
Transverse tubules	Yes	Yes
Sarcoplasmic reticulum	Well developed	Well developed
Mechanism of contraction	Sliding of thick and thin filaments past each other	Sliding of thick and thin filaments past each other
Innervation	Somatic nerves	Autonomic nerves
Initiation of contraction*	Neurogenic	Myogenic
Source of Ca^{2+} for activation†	SR	ECF and SR
Gap junctions between fibers?	No	Yes
Speed of contraction	Fast or slow depending on fiber type	Slow
Clear-cut relationship between length and tension	Yes	Yes

*Neurogenic muscles contract only when stimulated by synaptic input from a neuron. Myogenic muscles endogenously produce depolarizing membrane potentials, allowing them to contract independently of any neuronal input.

†SR, sarcoplasmic reticulum; ECF, extracellular fluid.

Source: Adapted from Sherwood, 2001.

(a) Vertebrate



(b) Arthropod

