

Muscle Anatomy

Skeletal muscle:

Temporalis

Masseter

Sternocleidomastoid

Pectoralis major

Biceps brachii

Abdominal muscles

Sartorius

Quadriceps femoris

Gastrocnemius



Cardiac muscle:
Heart

Smooth muscle:
Muscle of the
intestines and other
internal organs and
vessels

- **Skeletal**

- Unbranched;
striated;
multinucleate;
loooooong

- **Smooth**

- Unbranched;
unstriated;
uninucleate

- **Cardiac**

- Branched; striated;
intercalated discs

Characteristics of muscle

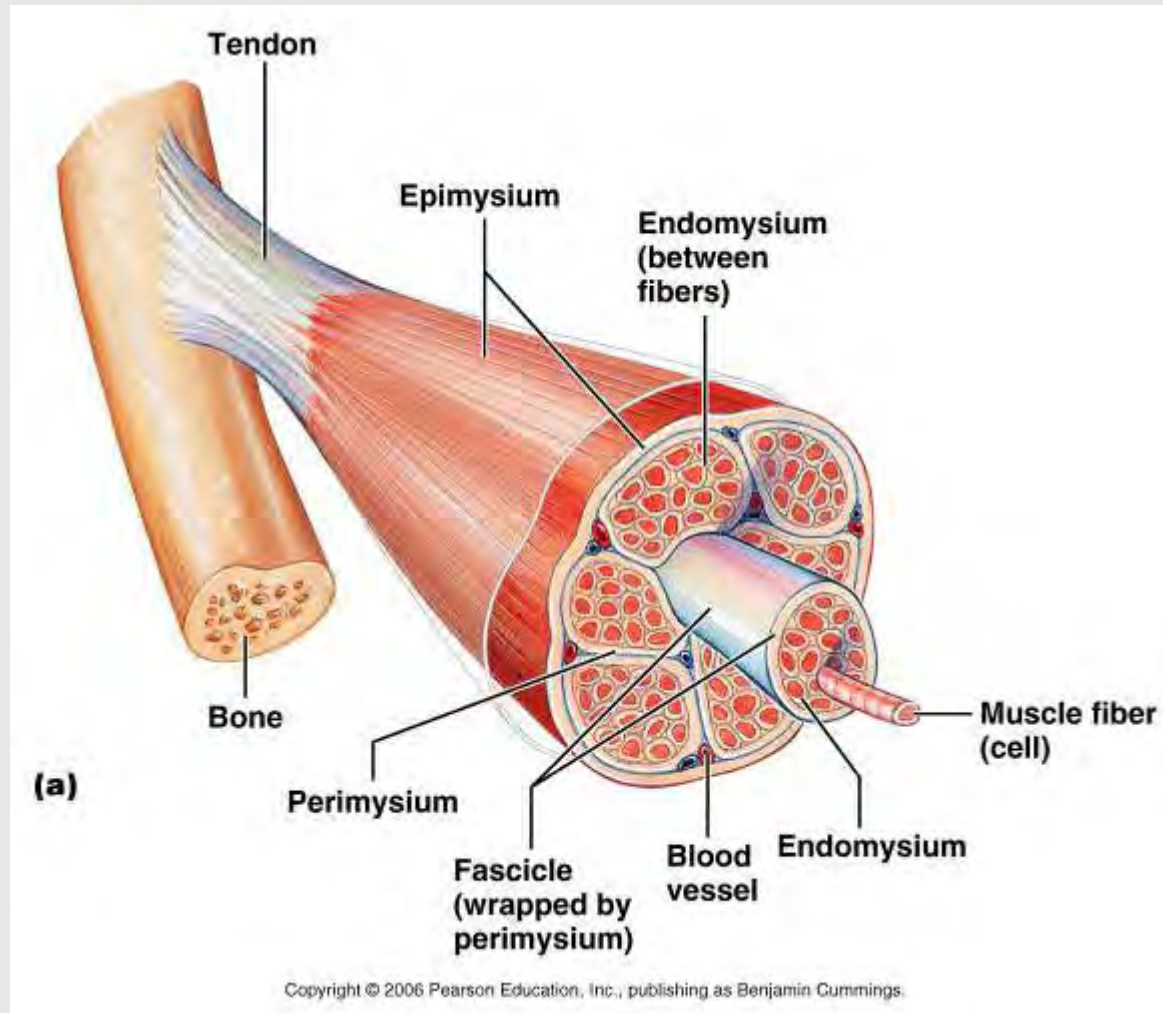
- **Contractile:** it shortens
- **Excitable:** receives & responds to electrical signals
- **Extensible:** stretches
- **Elastic:** Returns to original length after extending

Functions of skeletal muscle

- Movement
- Maintain posture & body position
- Stabilize joints, support visceral organs (rotator cuff)
- Maintain body temperature (shivering)
- Guard entrances & exits (esophageal & anal sphincter)

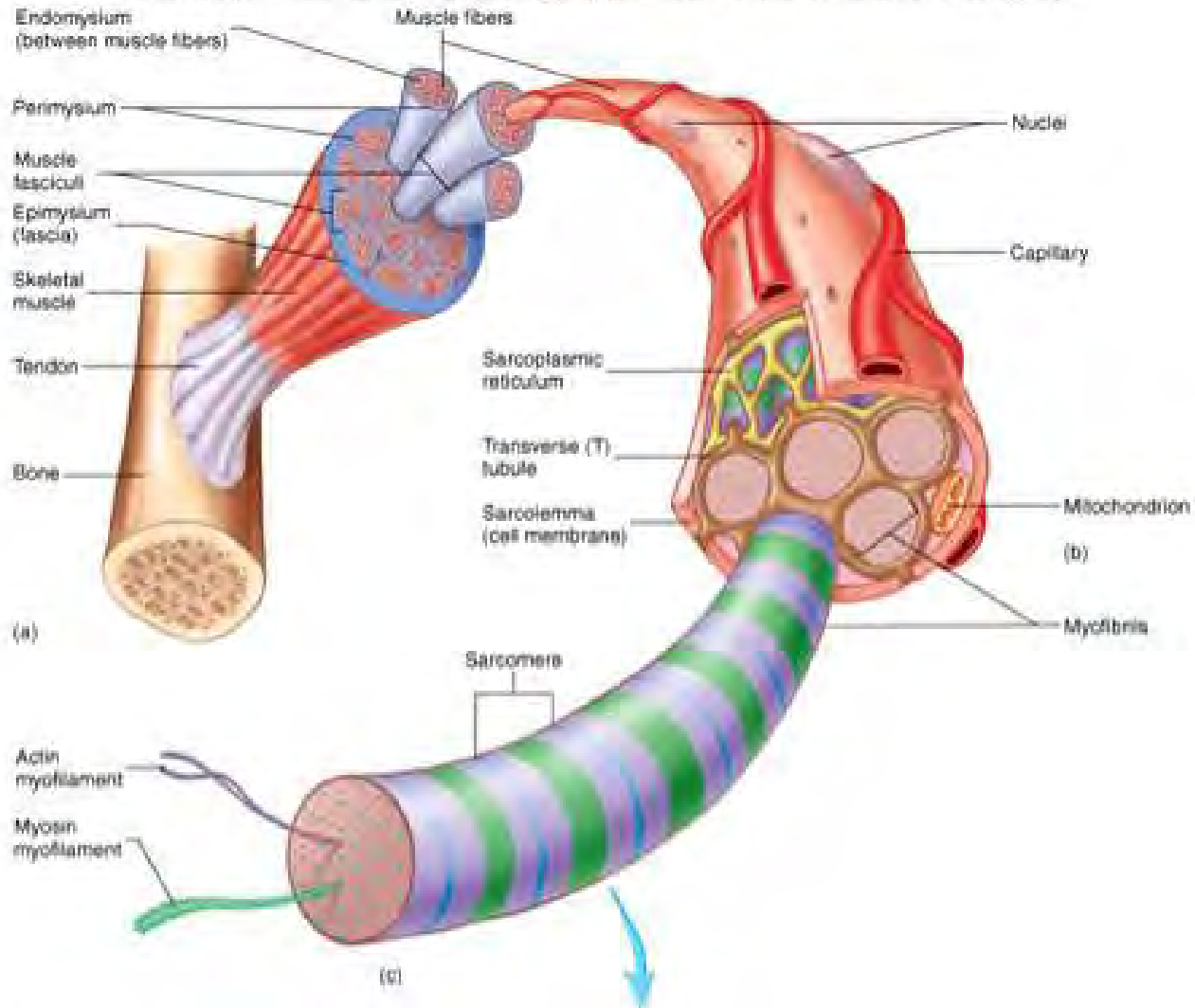
Arrangement: tubes within tubes

- **Epimysium:** surrounds **whole muscle**; collagen
- **Perimysium:** surrounds **fascicles**; collagen + elastin
- **Endomysium:** surrounds **muscle fibers**; collagen + elastin

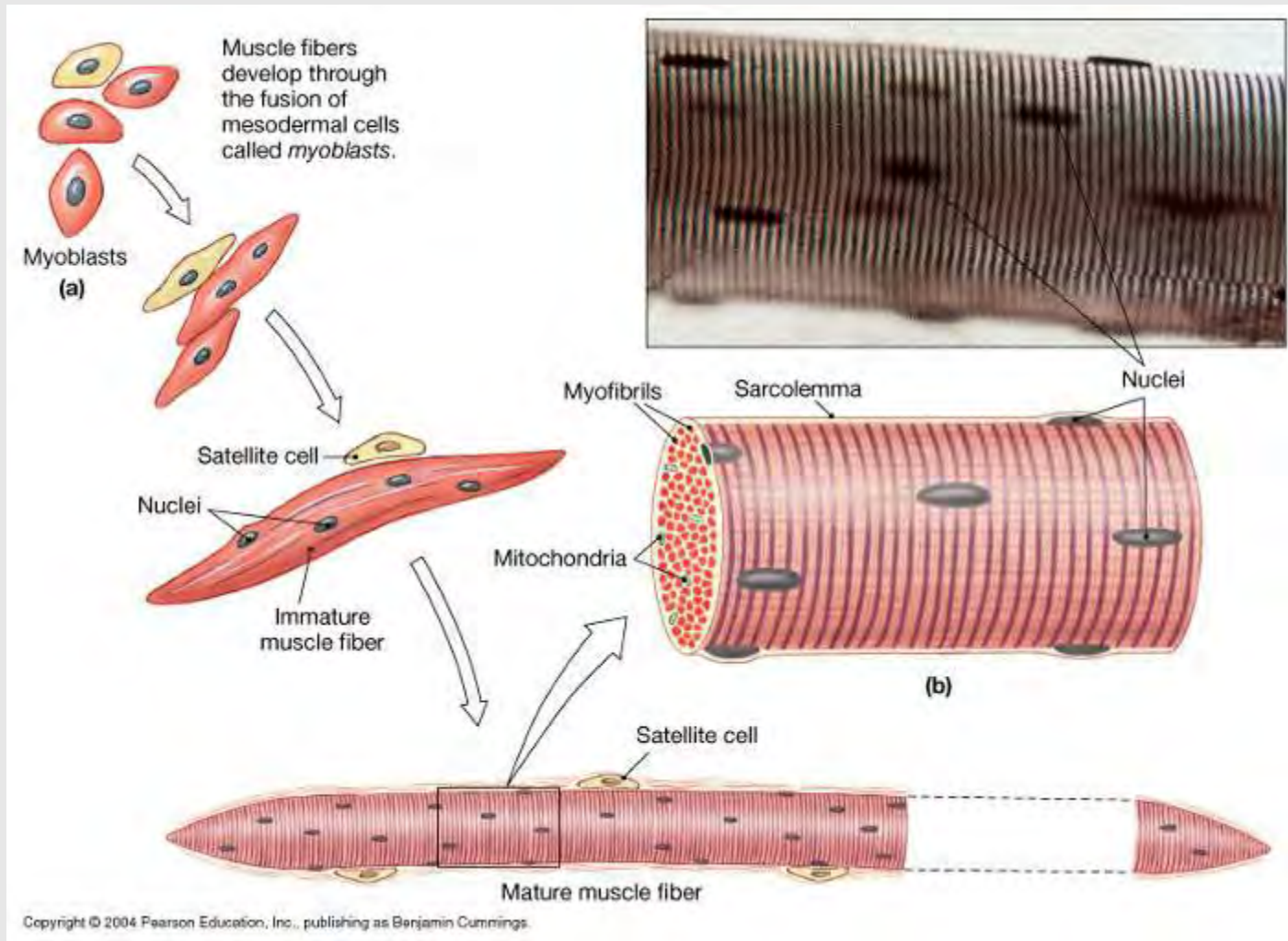


Tubes within tubes

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Myoblasts form muscle fibers (cells)



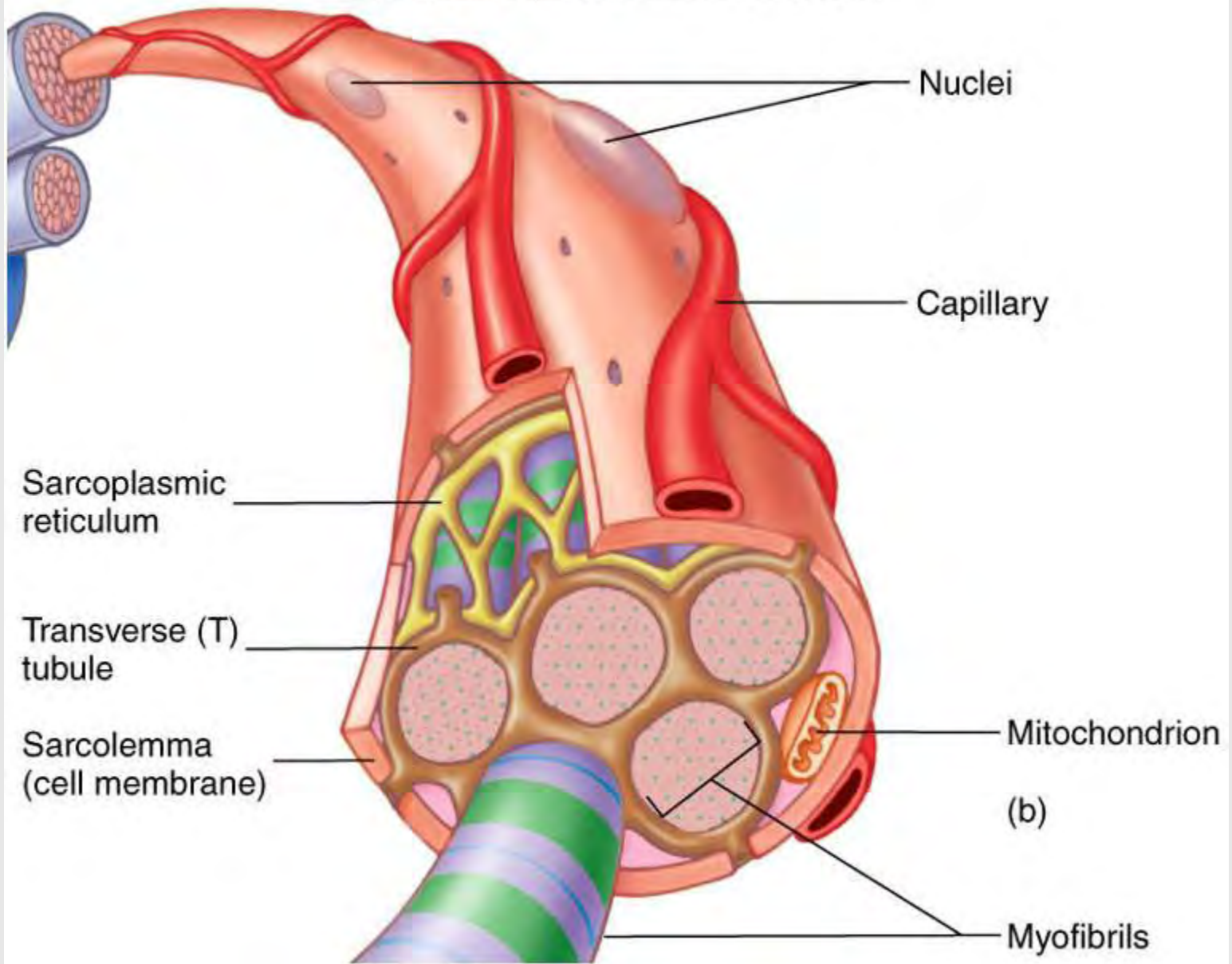
Skeletal muscle cells have the usual cell structures

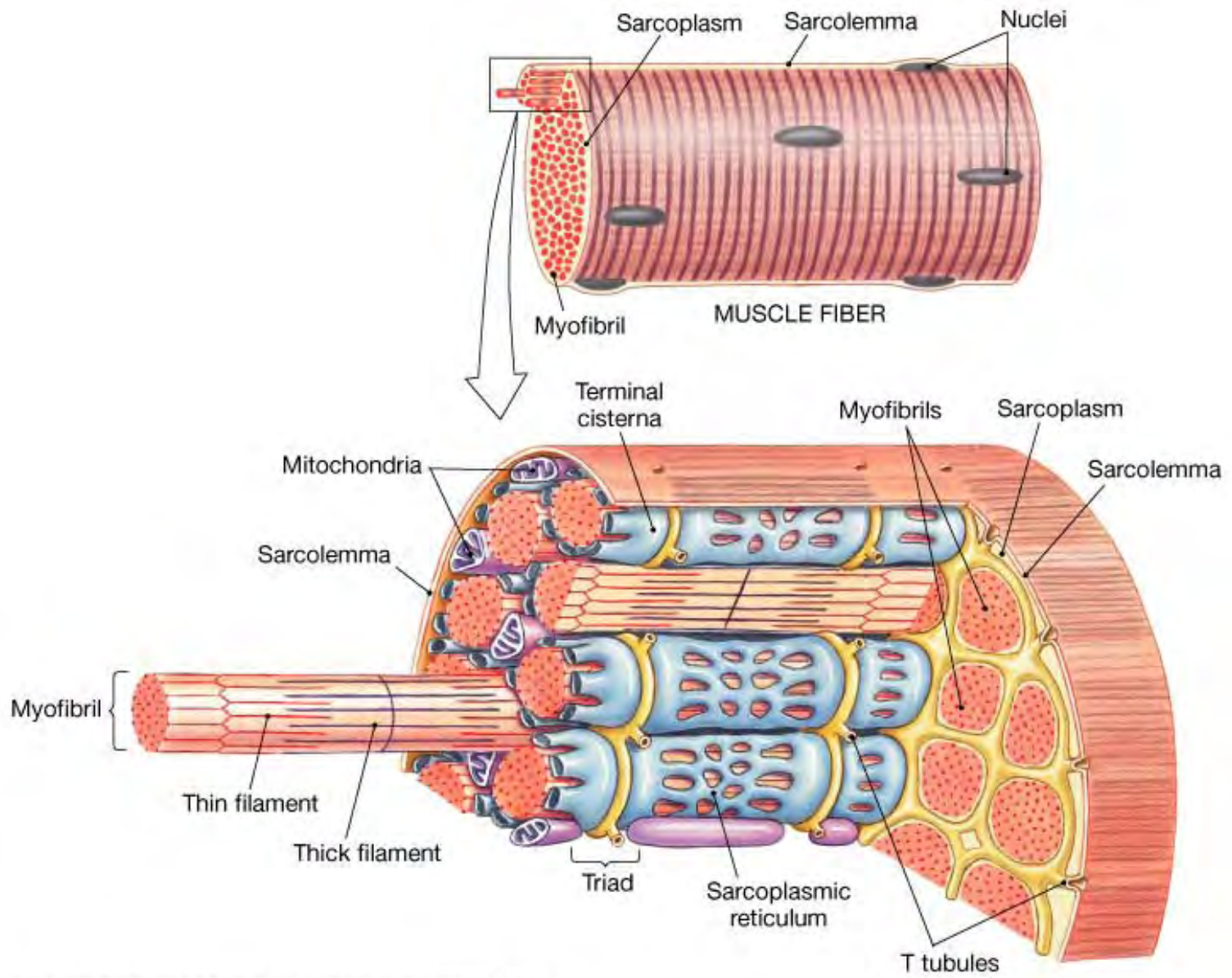
BUT they have different names

- **Sarcolemma:** plasma membrane
- **Sarcoplasm:** cytoplasm

Unique to skeletal muscle cells

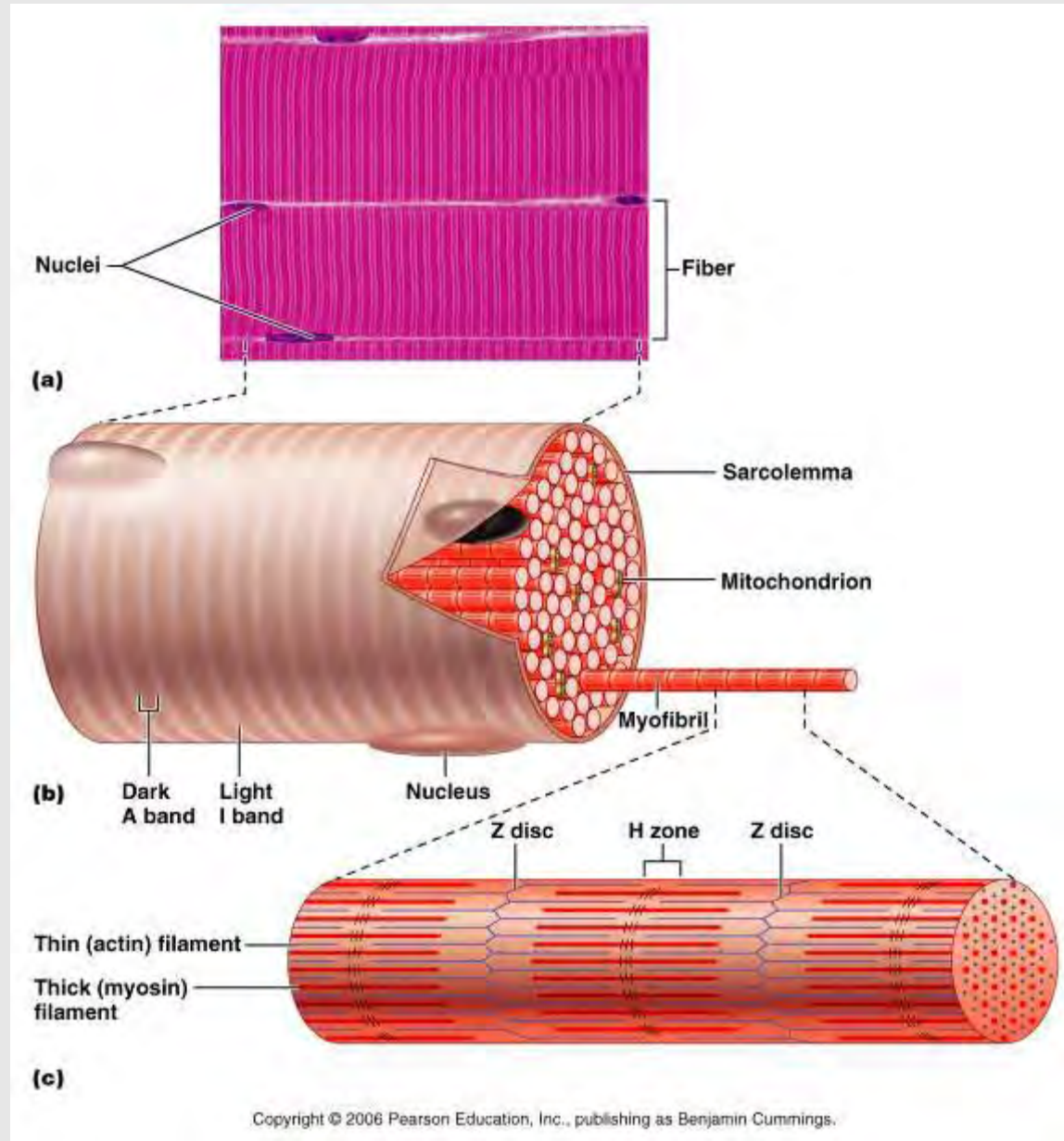
- **Transverse tubules:** conduct signal (Ca^{2+} ions) to contract
- **Sarcoplasmic reticulum:** SER; fuse and form terminal cisternae, which house (Ca^{2+} ions)





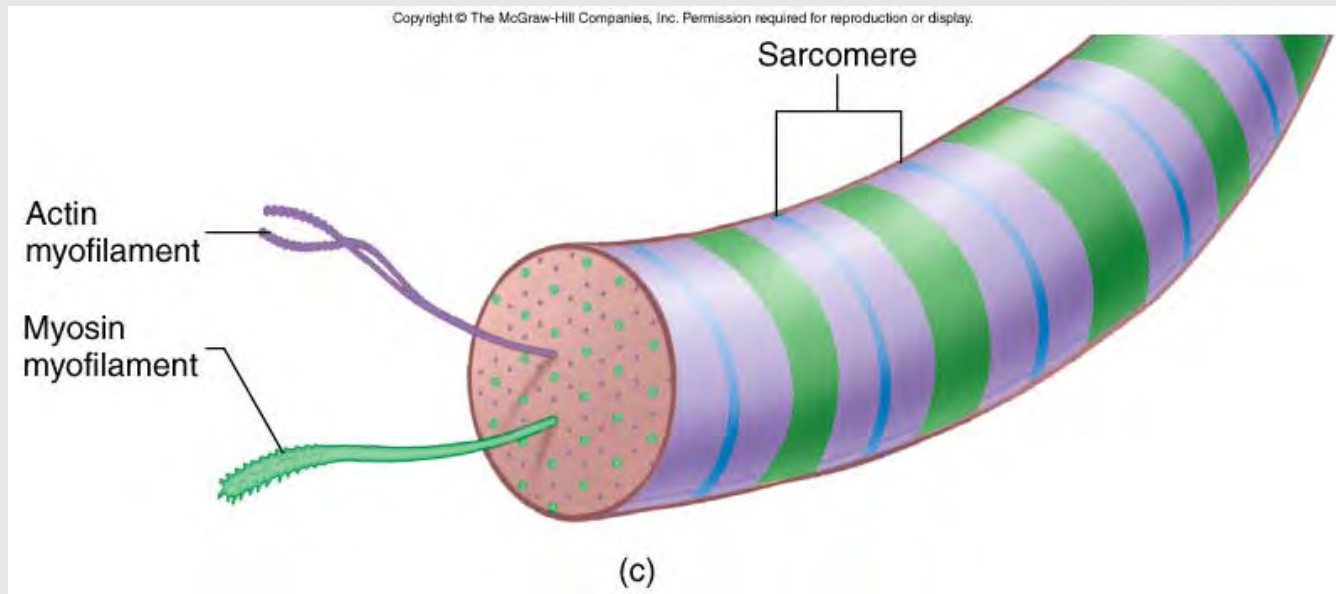
Muscle cells & Sarcomeres

- **Sarcomere = smallest contractile unit of muscle**
- **~ 10k arranged end to end form 1 myofibril**



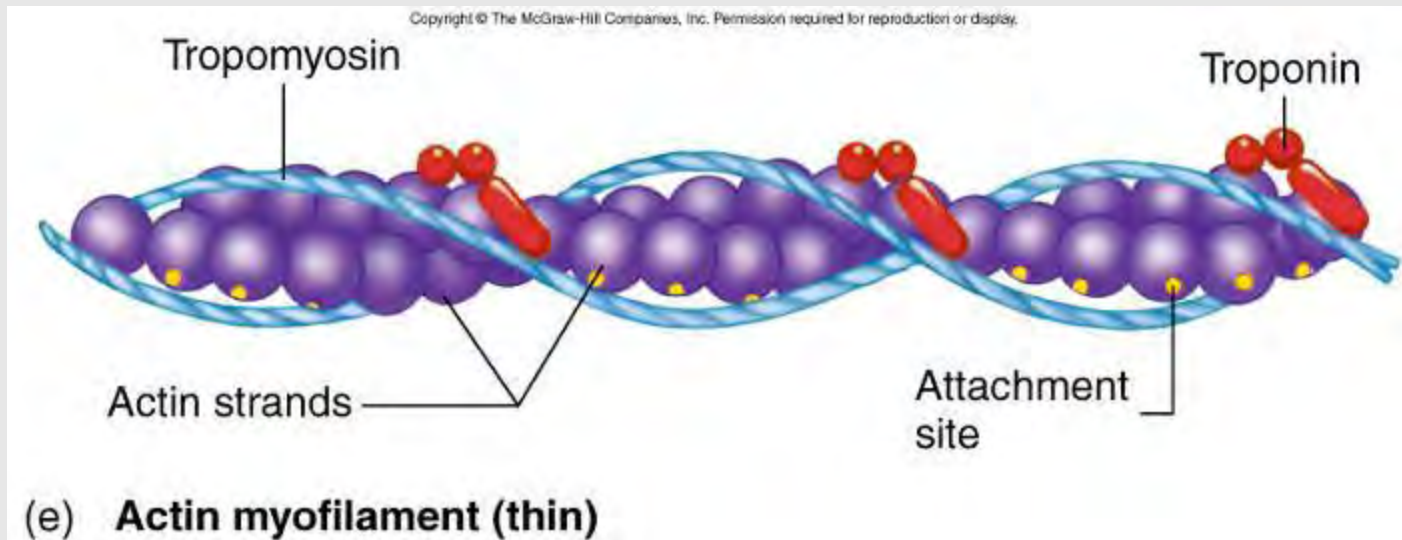
Myofibrils

- Contractile portions of muscle cells
- Consist of interdigitating **thick** and *thin* protein filaments
- **Thick** = **myosin**; *thin* = **actin**



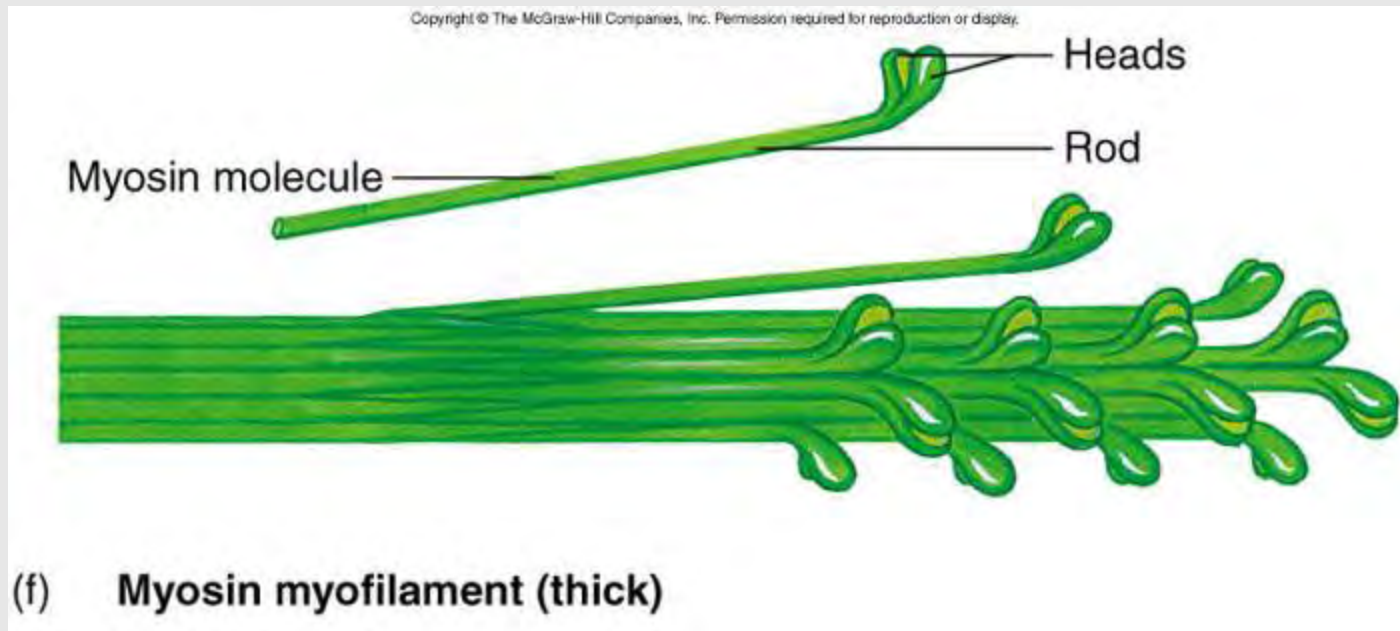
Thin filaments

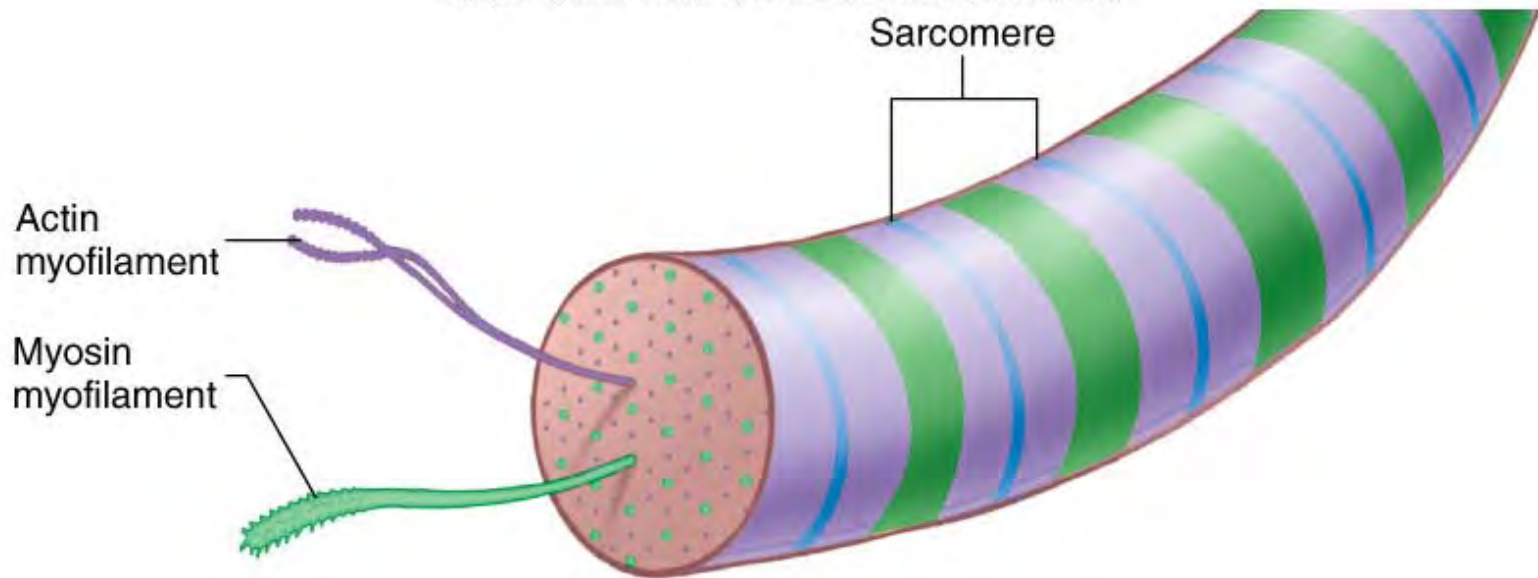
- Actin (F) strand made of actin subunits (G)
- Tropomyosin strands (barbed wire)
- Troponin molecules consist of 3 subunits
 - TnI: binds to actin
 - TnT: bonds to tropomyosin
 - TnC: binds Ca^{2+}



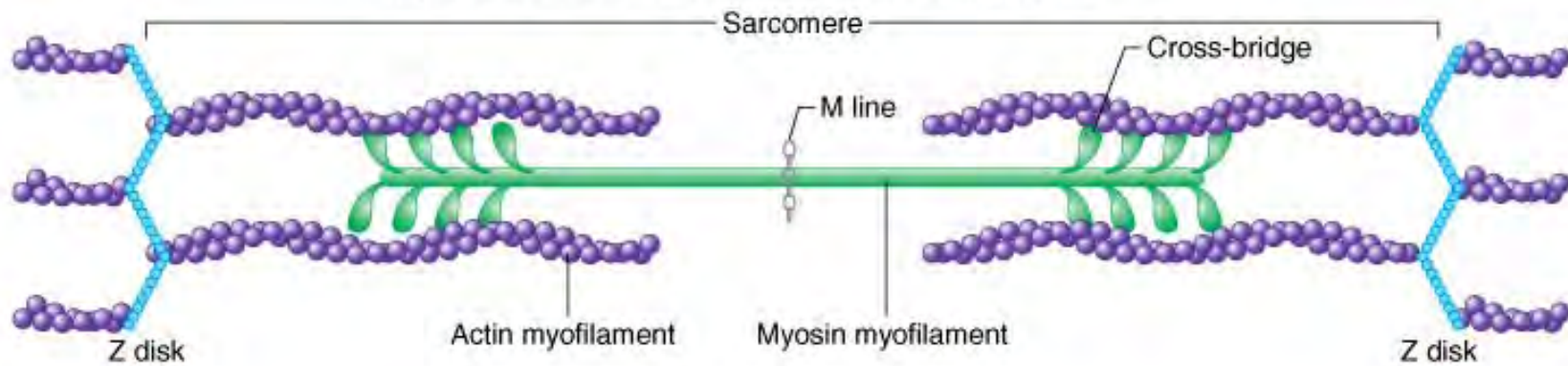
Thick filaments

- Composed of **myosin** (approximately 500)
- All arranged with tails pointing towards Midline (M)
- Head = two globular protein subunits that bind to **actin**

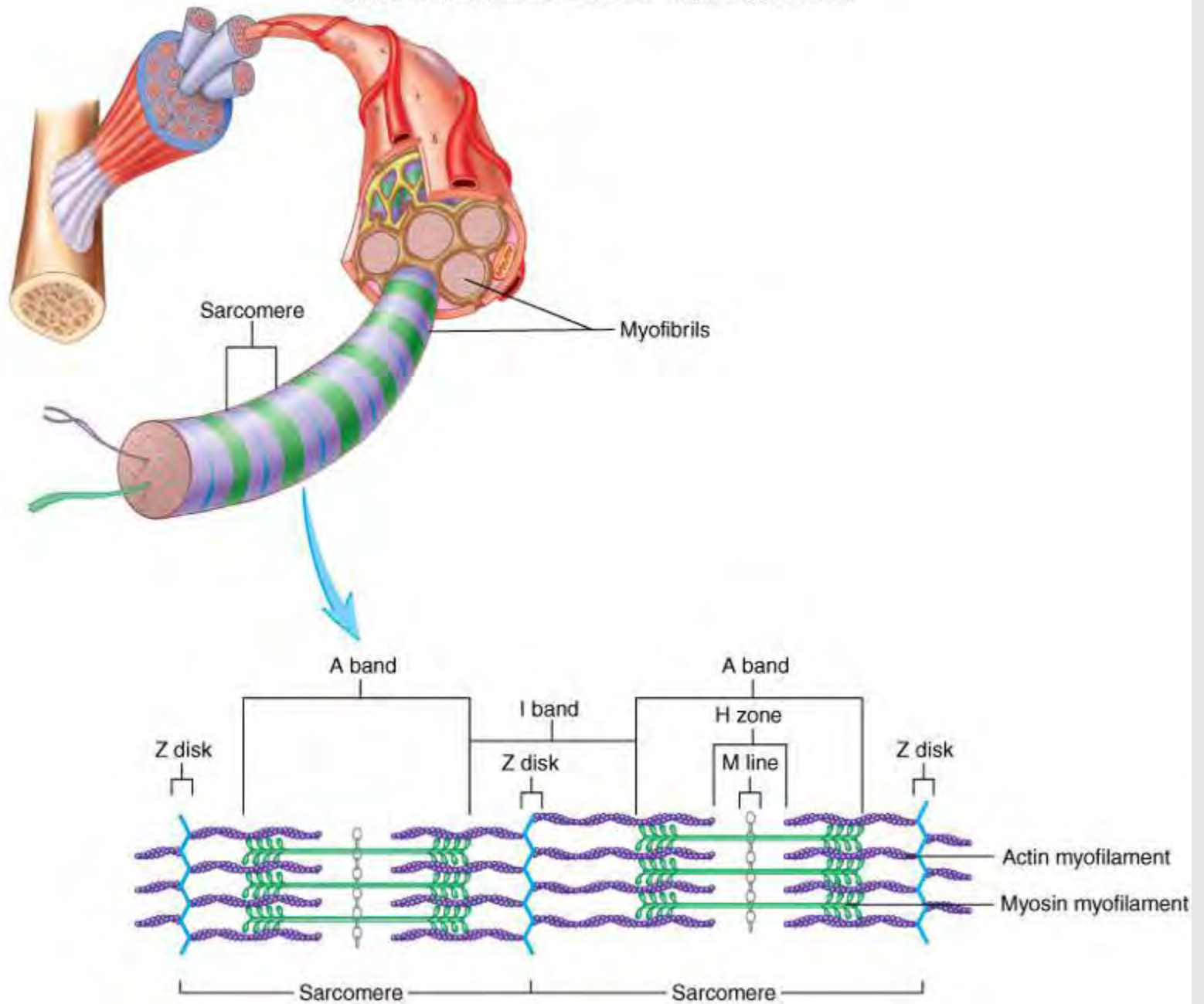


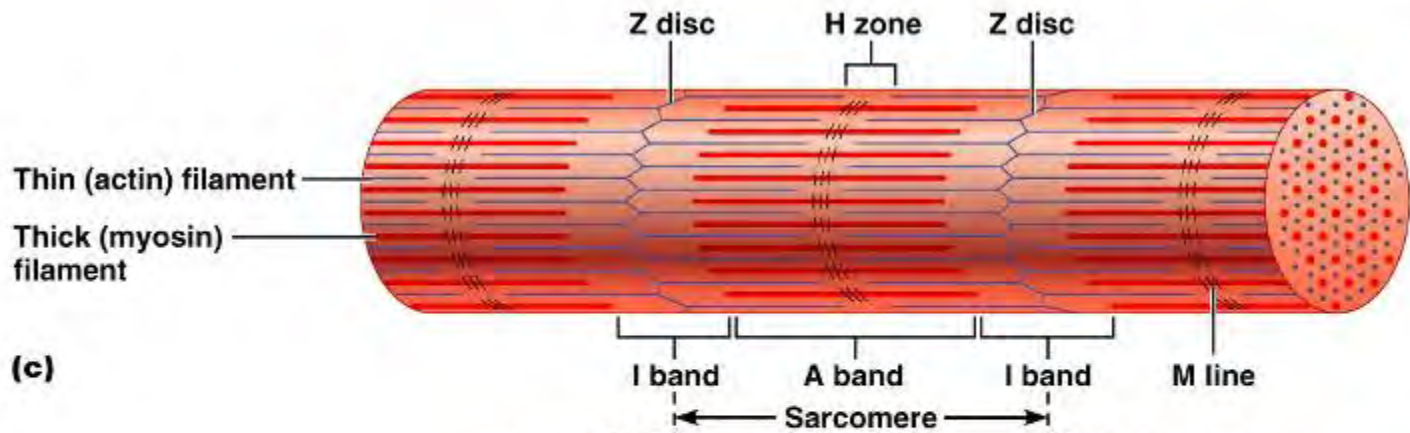


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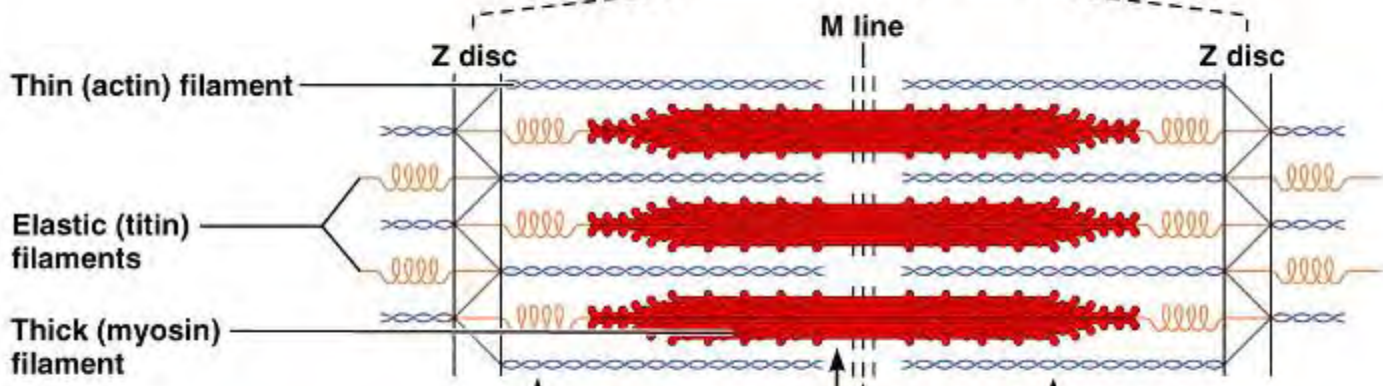


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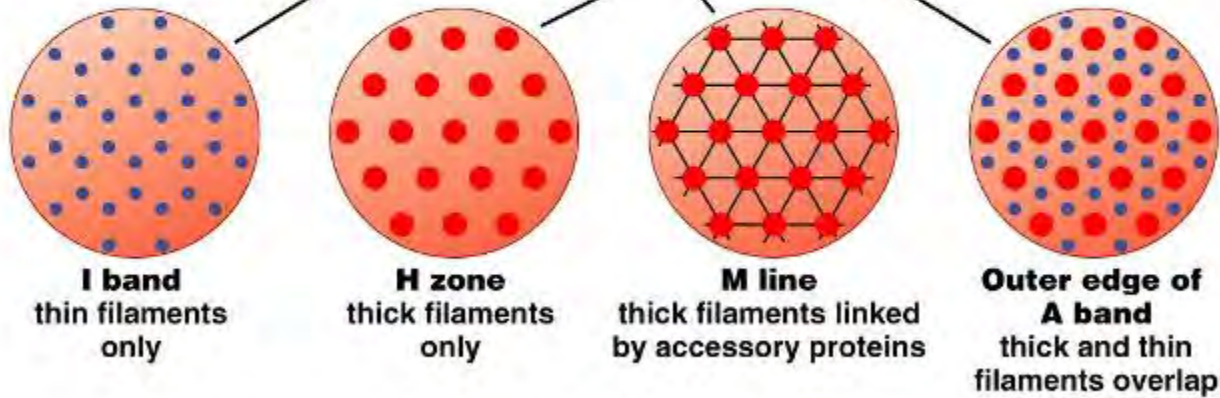




(c)



(d)



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