Settings

1
2

Item 1 of 2
Question Id: 1159

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom

A 3-year-old girl is brought to her pediatrician for a well child checkup. She has met all of the appropriate developmental milestones. Her height corresponds to the 60th percentile. Osteoblasts near the growth plates of her long bones secrete matrix material, and when they become trapped in the ossified matrix, they become known as osteocytes. These osteocytes remain connected to each other by:

- A. Tight junctions
- B. Hemidesmosomes
- C. Intermediate junctions
- D. Gap junctions
- E. Desmosomes

Submit

Block Time Remaining: 00:00:02
TUTOR

0 | Feedback | Suspend | End Block

7:30 PM
2/12/2019

Settings

1
2

Item 1 of 2
Question Id: 1159

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom

A 3-year-old girl is brought to her pediatrician for a well child checkup. She has met all of the appropriate developmental milestones. Her height corresponds to the 60th percentile. Osteoblasts near the growth plates of her long bones secrete matrix material, and when they become trapped in the ossified matrix, they become known as osteocytes. These osteocytes remain connected to each other by:

- A. Tight junctions [16%]
- B. Hemidesmosomes [5%]
- C. Intermediate junctions [14%]
- ✔ D. Gap junctions [46%]
- E. Desmosomes [16%]

Omitted
Correct answer
D

46%
Answered correctly

4 Seconds
Time Spent

09/27/2018
Last Updated

Explanation

Bone Structure: Osteocytes

Block Time Remaining: 00:00:04
TUTOR

0 | Feedback | Suspend | End Block

7:30 PM
2/12/2019

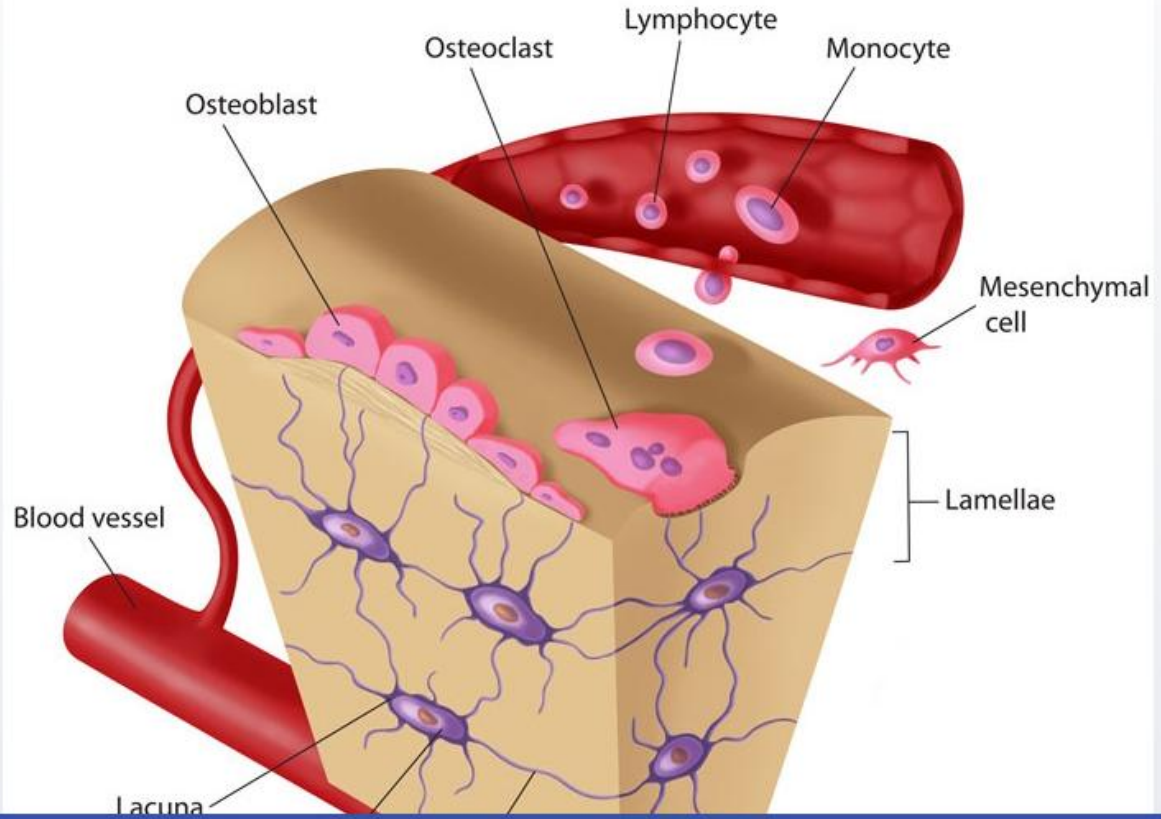
Settings

1
2

Item 1 of 2
Question Id: 1159

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom

Bone Structure: Osteocytes



Block Time Remaining: 00:00:04
TUTOR

0 | Feedback | Suspend | End Block

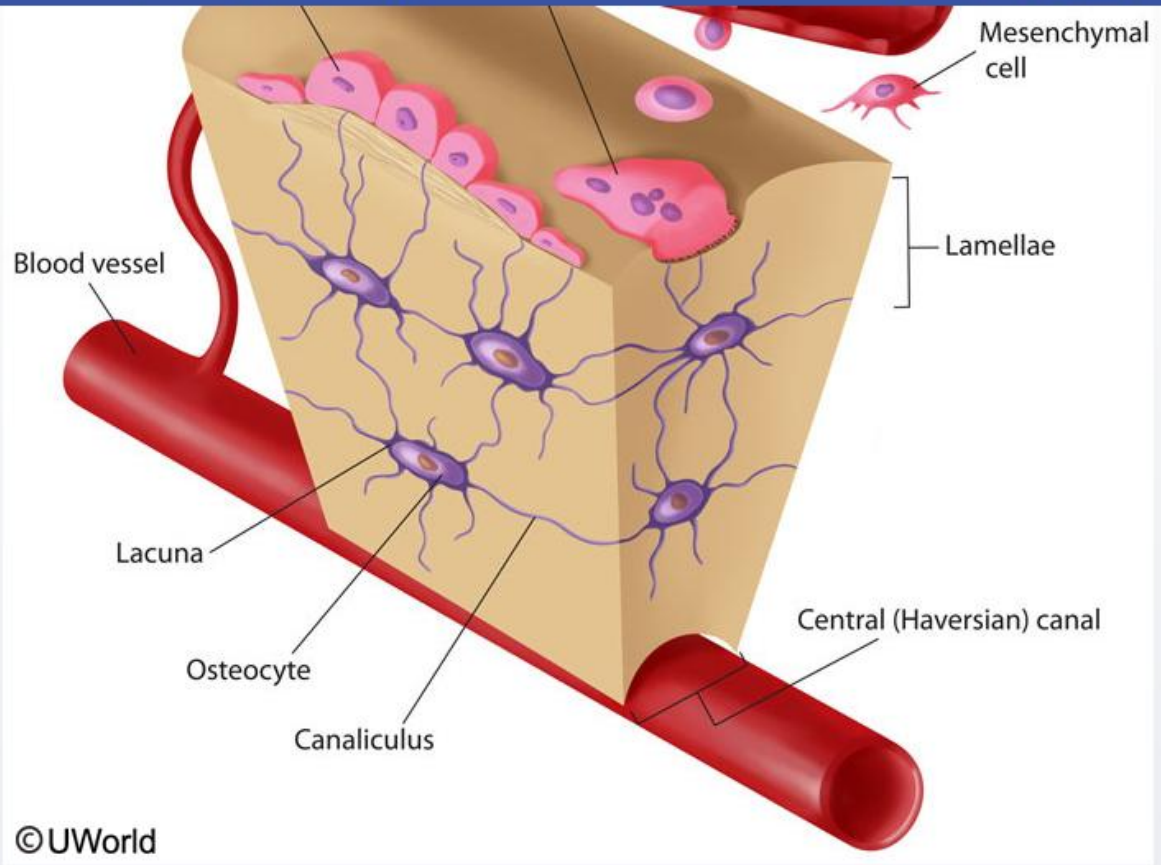
7:30 PM
2/12/2019

Settings

1
2

Item 1 of 2
Question Id: 1159

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom



Within a single Haversian system, the central canal is encircled by multiple concentric lamellae of bony matrix that each contains lacunae filled with osteocytes and extracellular bone fluid. Delicate canaliculi radiate from each lacuna to create a reticular network with adjacent lacunae, and

Block Time Remaining: 00:00:04
TUTOR

0 | Feedback | Suspend | End Block

7:30 PM
2/12/2019

Within a single Haversian system, the central canal is encircled by multiple concentric lamellae of bony matrix that each contains lacunae filled with osteocytes and extracellular bone fluid. Delicate canaliculi radiate from each lacuna to create a reticular network with adjacent lacunae, and the cytoplasmic processes of the osteocytes lie within these canaliculi. These cytoplasmic processes send signals to and exchange nutrients and waste products with the osteocytes within neighboring lamellae via gap junctions.

The osteocytes serve to maintain the structure of the mineralized matrix and control the short-term release and deposition of calcium (i.e., calcium homeostasis). The plasma calcium concentration directly dictates the metabolic activity of osteocytes, while parathyroid hormone and calcitonin indirectly influence their metabolic activity. Osteocytes can also sense mechanical stresses and send signals to modulate the activity of surface osteoblasts, thereby helping to regulate bony remodeling.

(Choice A) Tight junctions (zonula occludens) are observed at the apices of glandular cells and consist of two closely adherent cytoplasmic membranes without an intervening space. Tight junctions are the first component of the junctional complex.

(Choice B) Hemidesmosomes are half desmosomes that extend from the basal surfaces of keratinocytes in the stratified squamous epithelium to attach to the basal lamina.

(Choice C) Intermediate junctions (zonula adherens) are a delicate network of cytoplasmic filaments that radiate from the cell membrane to hold adjacent cells together. Intermediate junctions are the second component of the junctional complex.

(Choice E) Desmosomes are small, circular, adherent patches circumferentially placed around cells that comprise the third component of the junctional complex. These patches are particularly common in stratified squamous epithelium and contribute significantly to the structural cohesiveness of tissues subject to mechanical stressors.

Educational objective:
Osteocytes have long intracanalicular processes that extend through the ossified bone matrix. These cytoplasmic processes send signals to and exchange nutrients and waste products with the osteocytes within neighboring lamellae via gap junctions. Osteocytes can sense mechanical stresses and send signals to modulate the activity of surface osteoblasts, thereby helping to regulate bony remodeling.

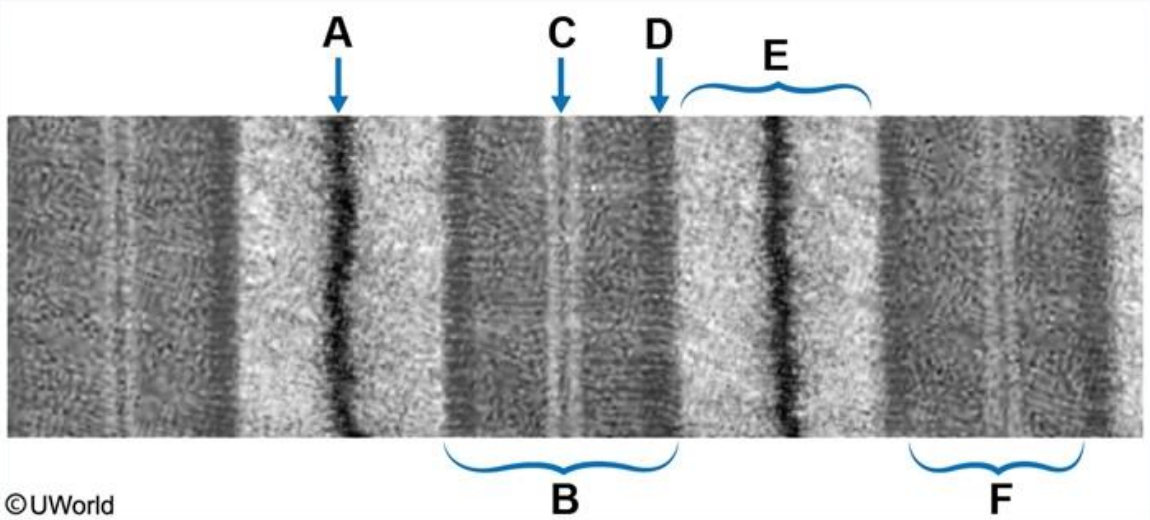
Settings

1
2

Item 2 of 2
Question Id: 1734

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom

A researcher is investigating the structure of the sarcomere using skeletal muscle obtained from an experimental animal. He develops monoclonal antibodies directed against a specific skeletal muscle protein and finds that these antibodies disrupt the binding of actin to structural support elements within the sarcomere. Electron microscopy of the sarcomere is shown in the image below.



Which of the following labeled regions do these antibodies most likely bind?

A. A
B. B
C. C
D. D

Block Time Remaining: 00:00:06
TUTOR

0 | Feedback | Suspend | End Block

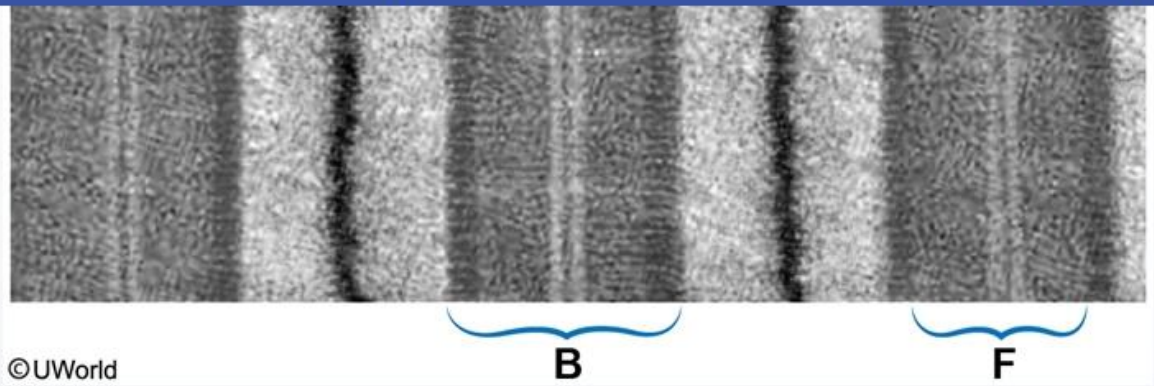
7:30 PM
2/12/2019

Settings

1
2

Item 2 of 2
Question Id: 1734

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom



Which of the following labeled regions do these antibodies most likely bind?

- A. A
- B. B
- C. C
- D. D
- E. E
- F. F

Submit

Block Time Remaining: 00:00:08
TUTOR

0 | Feedback | Suspend | End Block

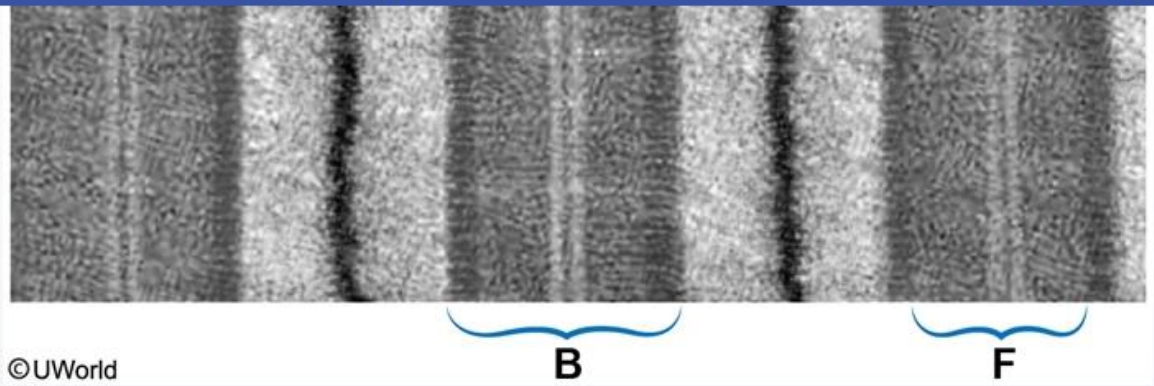
7:30 PM
2/12/2019

Settings

1
2

Item 2 of 2
Question Id: 1734

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom



Which of the following labeled regions do these antibodies most likely bind?

- A. A [47%]
- B. B [8%]
- C. C [12%]
- D. D [15%]
- E. E [13%]
- F. F [3%]

Omitted
Correct answer

47%
Answered correctly

6 Seconds
Time Spent

09/15/2018
Last Updated

Block Time Remaining: 00:00:10
TUTOR

0 | Feedback | Suspend | End Block

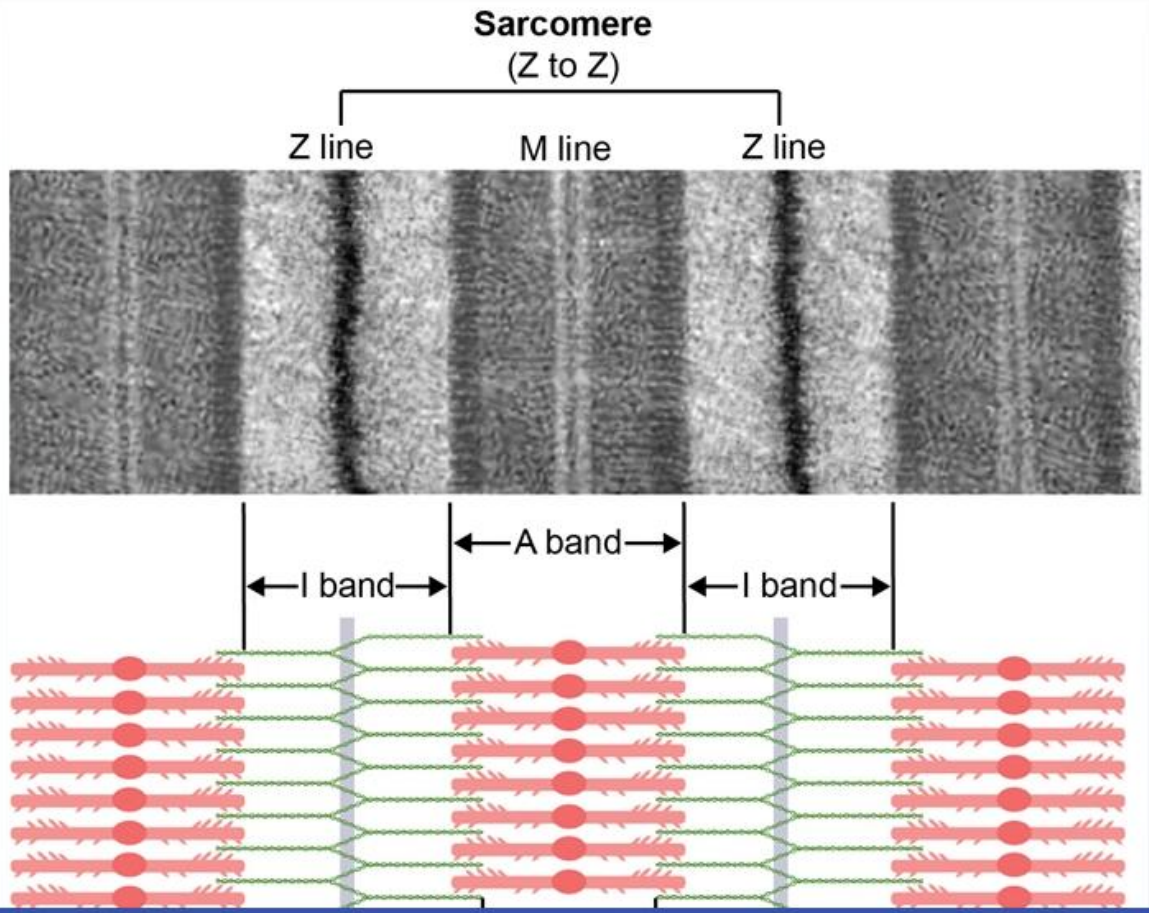
7:30 PM
2/12/2019

Settings

1
2

Item 2 of 2
Question Id: 1734

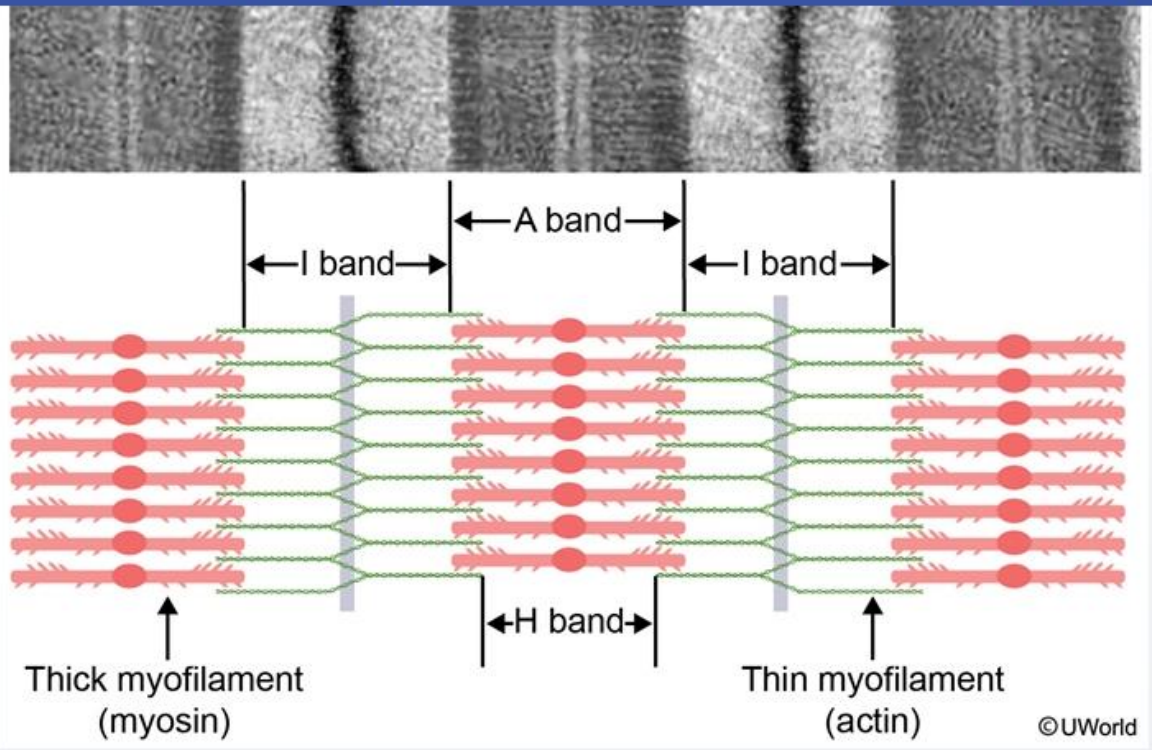
Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom



Block Time Remaining: 00:00:10
TUTOR

Feedback | Suspend | End Block

7:30 PM
2/12/2019



A **sarcomere** is composed of overlapping filaments of actin and myosin as well as structural and binding proteins (eg, titin, α-actinin). A single sarcomere is defined as the distance between two Z lines. **Thin (actin) filaments** are bound to structural proteins at the **Z line**. The unbound ends of the actin filaments project into the middle of the sarcomere, where they interact with thick (myosin) filaments during muscle contraction.

(Choice B) The A band corresponds to myosin filaments in the sarcomere. In this region, there are myosin filaments overlapped with actin filaments as well as non-overlapped myosin filaments. The A band always remains the same length during muscle contraction.

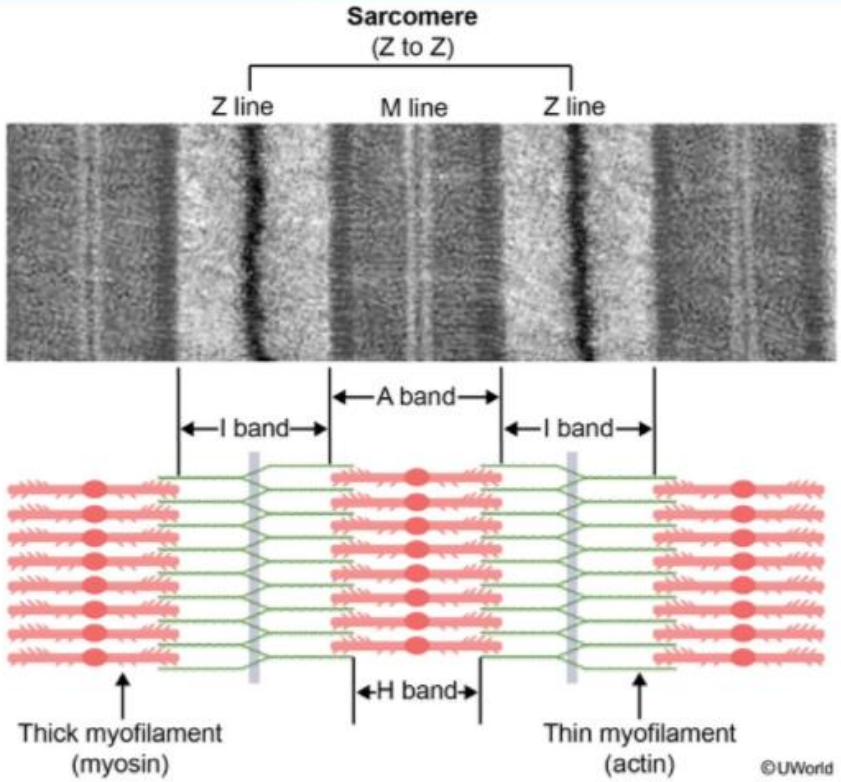
Settings

1
2

Item 2 of 2
Question Id: 1734

Mark | Previous | Next | Tutorial | Lab Values | Notes | Calculator | Reverse Color | Text Zoom

Exhibit Display



Zoom In | Zoom Out | Reset | Add To Flash Card

filaments as well as non-overlapped myosin filaments. The A band always remains the same length during muscle contraction.

Block Time Remaining: 00:00:10
TUTOR

0 | Feedback | Suspend | End Block

7:30 PM
2/12/2019

A **sarcomere** is composed of overlapping filaments of actin and myosin as well as structural and binding proteins (eg, titin, α-actinin). A single sarcomere is defined as the distance between two Z lines. **Thin (actin) filaments** are bound to structural proteins at the **Z line**. The unbound ends of the actin filaments project into the middle of the sarcomere, where they interact with thick (myosin) filaments during muscle contraction.

(Choice B) The A band corresponds to myosin filaments in the sarcomere. In this region, there are myosin filaments overlapped with actin filaments as well as non-overlapped myosin filaments. The A band always remains the same length during muscle contraction.

(Choice C) The M line lies at the center of the A band and is where myosin filaments anchor to structural elements in the center of the sarcomere.

(Choice D) Myosin and actin filaments overlap at the segment of the sarcomere between the H and I bands.

(Choices E and F) The I band is the region of the sarcomere in which actin does not overlap with myosin, and the H band is the region in which myosin does not overlap with actin. During muscle contraction, both H and I bands decrease in length.

Educational objective:
A single sarcomere is defined as the distance between two Z lines. Thin (actin) filaments in the I band are bound to structural proteins at the Z line, whereas thick (myosin) filaments in the A band are bound to structural proteins at the M line.

References

- The muscle ultrastructure: a structural perspective of the sarcomere.
- The sarcomeric cytoskeleton: from molecules to motion.