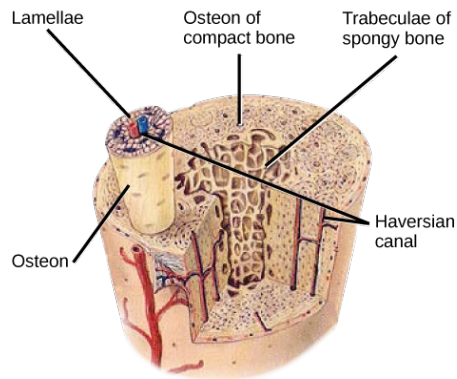


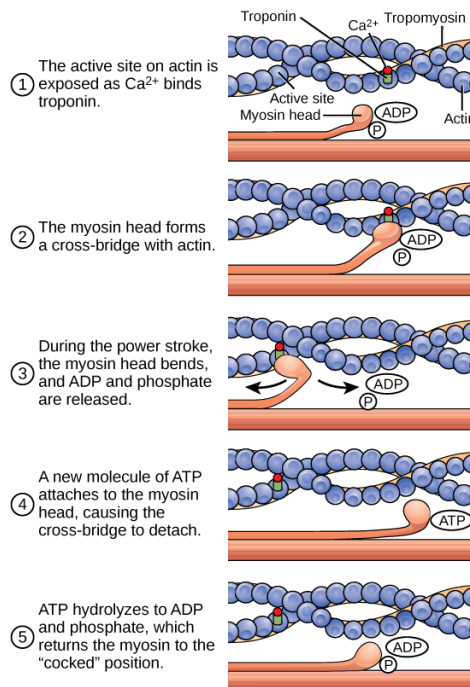
Biology 2eUnit 7: **Animal Structure and Function**Chapter 38: **The Musculoskeletal System****Visual Connection Questions**

1. Which of the following statements about bone tissue is false?



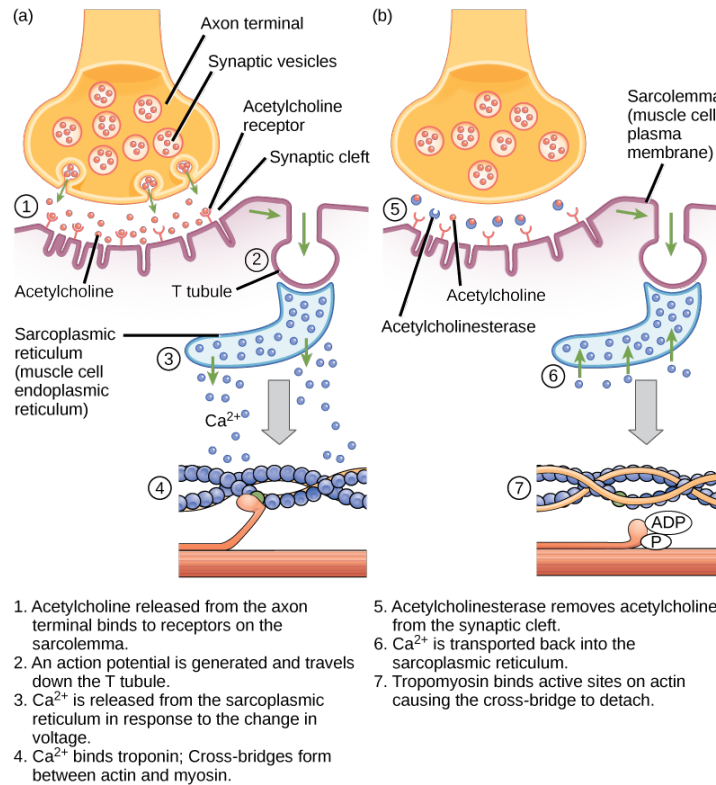
b. Haversian canals contain blood vessels only.

2. Which of the following statements about muscle contraction is true?



b. The power stroke occurs when ADP and phosphate dissociate from the myosin head.

3. The deadly nerve gas Sarin irreversibly inhibits acetylcholinesterase. What effect would Sarin have on muscle contraction?



In the presence of Sarin, acetylcholine is not removed from the synapse, resulting in continuous stimulation of the muscle plasma membrane. At first, muscle activity is intense and uncontrolled, but the ion gradients dissipate, so electrical signals in the T-tubules are no longer possible. The result is paralysis, leading to death by asphyxiation.

Review Questions

4. The forearm consists of the:

a. radius and ulna

5. The pectoral girdle consists of the:

c. clavicle and scapula

6. All of the following are groups of vertebrae except _____, which is a curvature.

d. pelvic

7. Which of these is a facial bone?

c. lacrimal

8. Which of the following is **not** true statement comparing exoskeletons and endoskeletons?

d. Exoskeletons provide less mechanical leverage.

9. The Haversian canal:

b. contains the bone's blood vessels and nerve fibers

10. The epiphyseal plate:

c. is responsible for the lengthwise growth of long bones

11. The cells responsible for bone resorption are _____.

a. osteoclasts

12. Compact bone is composed of _____.

c. osteons

13. Osteoporosis is a condition where bones become weak and brittle. It is caused by an imbalance in the activity of which cells?

a. Osteoclasts and osteoblasts

14. While assembling a skeleton of a new species, a scientist points to one of the bones and observes that it looks like the most likely site of leg muscle attachment. What kind of bone did she indicate?

d. Flat bone

15. Synchondroses and symphyses are:

b. cartilaginous joints

16. The movement of bone away from the midline of the body is called _____.

d. abduction

17. Which of the following is not a characteristic of the synovial fluid?

c. regulation of water balance in the joint

18. The elbow is an example of which type of joint?

a. hinge

19. A high ankle sprain is an injury caused by over-stretching the ligaments connecting the tibia and fibula. What type of joint is involved in this sprain?

c. Syndesmosis

20. In relaxed muscle, the myosin-binding site on actin is blocked by _____.

d. tropomyosin

21. The cell membrane of a muscle fiber is called a _____.

b. sarcolemma

22. The muscle relaxes if no new nerve signal arrives. However the neurotransmitter from the previous stimulation is still present in the synapse. The activity of _____ helps to remove this neurotransmitter.

d. acetylcholinesterase

23. The ability of a muscle to generate tension immediately after stimulation is dependent on:

d. none of the above

24. Botulinum toxin causes flaccid paralysis of the muscles, and is used for cosmetic purposes under the name Botox. Which of the following is the most likely mechanism of action of Botox?

d. Botox decreases the release of acetylcholine from motor neurons.

Critical Thinking Questions

25. What are the major differences between the male pelvis and female pelvis that permit childbirth in females?

The female pelvis is tilted forward and is wider, lighter, and shallower than the male pelvis. It is also has a pubic angle that is broader than the male pelvis.

26. What are the major differences between the pelvic girdle and the pectoral girdle that allow the pelvic girdle to bear the weight of the body?

The pelvic girdle is securely attached to the body by strong ligaments, unlike the pectoral girdle, which is sparingly attached to the ribcage. The sockets of the pelvic girdle are deep, allowing the femur to be more stable than the pectoral girdle, which has shallow sockets for the scapula. Most tetrapods have 75 percent of their weight on the front legs because the head and neck are so heavy; the advantage of the shoulder joint is more degrees of freedom in movement.

27. Both hydrostatic and exoskeletons can protect internal organs from harm. Contrast the ways the skeletons perform these functions.

Hydrostatic skeletons protect internal organs from harm by cushioning them from external shock. However, these skeletons do not provide protection from external trauma. Exoskeletons are hard structures that protect the organs from damage caused by their environment. However, since they are rigid, they provide little shock absorption, so the animal will need to have other ways of cushioning its internal organs.

28. Scoliosis is a medical condition where the spine develops a sideways curvature. How would this change interfere with the normal function of the spine?

Normal vertebral columns are stacked in a vertical line. If the spine were to curve to the side instead this would disrupt the support and cushioning functions of the vertebrae. When the spine is out of alignment, it cannot absorb shock as well so normal activities can become painful and cause back problems later in life. The curvature also disrupts posture and structure, even disrupting lung expansion in severe cases due to changes to rib location.

29. What are the major differences between spongy bone and compact bone?

Compact bone tissue forms the hard external layer of all bones and consists of osteons. Compact bone tissue is prominent in areas of bone at which stresses are applied in only a few directions. Spongy bone tissue forms the inner layer of all bones and consists of trabeculae. Spongy bone is prominent in areas of bones that are not heavily stressed or at which stresses arrive from many directions.

30. What are the roles of osteoblasts, osteocytes, and osteoclasts?

Osteocytes function in the exchange of nutrients and wastes with the blood. They also maintain normal bone structure by recycling the mineral salts in the bony matrix. Osteoclasts remove bone tissue by releasing lysosomal enzymes and acids that dissolve the bony matrix. Osteoblasts are bone cells that are responsible for bone formation.

31. Thalidomide was a morning sickness drug given to women that caused babies to be born without arm bones. If recent studies have shown that thalidomide prevents the formation of new blood vessels, describe the type of bone development inhibited by the drug and what stage of ossification was affected.

Thalidomide effected the development of the long bones of the arms, disrupting endochondral ossification. The bones would have been able to develop into a template made of the calcified cartilage matrix, but new blood vessels could not be created. Since no vessels invade the template, the structure is not converted into trabecular bone.

32. What movements occur at the hip joint and knees as you bend down to touch your toes?

The hip joint is flexed and the knees are extended.

33. What movement(s) occur(s) at the scapulae when you shrug your shoulders?

Elevation is the movement of a bone upward, such as when the shoulders are shrugged, lifting the scapulae. Depression is the downward movement of a bone, such as after the shoulders are shrugged and the scapulae return to their normal position from an elevated position.

34. Describe the joints and motions involved in taking a step forward if a person is initially standing still. Assume the person holds their foot at the same angle throughout the motion.

Taking a step would require bending the knee (modified hinge joint) and moving the leg in the hip (ball and socket joint) since the motion of the foot is excluded. As the foot comes off the ground in the step, the hip joint is going to move the femur in a protracted motion and the knee will flex the shin toward the thigh. As the foot lands, the knee extends the leg and the hip retracts the femur.

35. How would muscle contractions be affected if ATP was completely depleted in a muscle fiber?

Because ATP is required for myosin to release from actin, muscles would remain rigidly contracted until more ATP was available for the myosin cross-bridge release. This is why dead vertebrates undergo rigor mortis.

36. What factors contribute to the amount of tension produced in an individual muscle fiber?

The cross-sectional area, the length of the muscle fiber at rest, and the frequency of neural stimulation.

37. What effect will low blood calcium have on neurons? What effect will low blood calcium have on skeletal muscles?

Neurons will not be able to release neurotransmitter without calcium. Skeletal muscles have calcium stored and don't need any from the outside.

38. Skeletal muscles can only produce a mechanical force as they are contracted, but a leg flexes and extends while walking. How can muscles perform this task?

Muscles are able to drive locomotion (and other task involving opposing motions) because they are paired. When walking, the hamstring muscle contracts first, causing the leg to flex around the knee joint. The quadriceps muscle then contracts (while the hamstring relaxes and extends) to straighten the leg as the foot returns to the ground.