CHAPTER 45—SKELETAL, MUSCULAR, AND INTEGUMENTARY SYSTEMS

MULTIPLE CHOICE

1. Tissue that is specialized to cover the inner and outer surfaces of the internal organs is called
   a. epithelial tissue.
   b. connective tissue.
   c. muscle tissue.
   d. nervous tissue.

   ANS: A DIF: 1 OBJ: 45-1.1

2. Tightly connected cells that are arranged in flat sheets are characteristic of
   a. epithelial tissue.
   b. connective tissue.
   c. muscle tissue.
   d. nervous tissue.

   ANS: A DIF: 1 OBJ: 45-1.1

3. Blood, bone, and cartilage are examples of
   a. three different tissue types found in the body.
   b. connective tissue.
   c. epithelial tissue.
   d. organs of the body.

   ANS: B DIF: 1 OBJ: 45-1.1

4. Connective tissues include
   a. tendons that connect muscle to bone.
   b. the layer beneath your skin that connects the skin to muscle.
   c. fat.
   d. All of the above

   ANS: D DIF: 1 OBJ: 45-1.1

5. From the smallest functional units to the largest, the body is organized as follows:
   a. cell, system, organ, tissue, body.
   b. organ, cell, tissue, system, body.
   c. system, organ, tissue, cell, body.
   d. cell, tissue, organ, system, body.

   ANS: D DIF: 1 OBJ: 45-1.2

6. Organs that work together form
   a. connective tissues.
   b. tissue systems.
   c. organ systems.
   d. All of the above

   ANS: C DIF: 1 OBJ: 45-1.2

7. The heart and the blood vessels are separate organs that form the
   a. skeletal system.
   b. cardiovascular system.
   c. reproductive system.
   d. digestive system.

   ANS: B DIF: 1 OBJ: 45-1.3

8. Which of the following is a function of *both* the excretory system and the digestive system?
   a. regulating metabolism
   b. eliminating wastes
   c. regulating other organ systems
   d. maintaining homeostasis

   ANS: B DIF: 1 OBJ: 45-1.3

9. The lungs are located in the
   a. cranial cavity.
   b. abdominal cavity.
   c. thoracic cavity.
   d. spinal cavity.

   ANS: C DIF: 1 OBJ: 45-1.4

10. Which of the following is *not* part of the axial skeleton?
   a. the backbone
   b. the pelvis
   c. the rib cage
   d. the skull

   ANS: B DIF: 1 OBJ: 45-2.1

11. Yellow bone marrow
   a. provides internal support to spongy bone.
   b. produces red blood cells.
   c. is found only in lower vertebrates.
   d. provides an energy reserve.

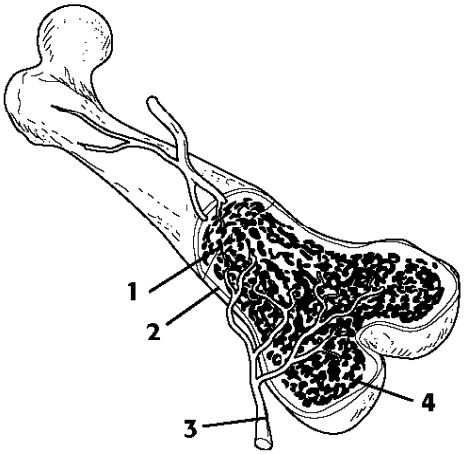
   ANS: D DIF: 1 OBJ: 45-2.2

12. The type of bone that provides the greatest strength for support is
   a. spongy bone.
   b. chitinous bone.
   c. compact bone.
   d. marrow bone.

   ANS: C DIF: 1 OBJ: 45-2.2

13. The periosteum is a section of the bone that contains
   a. blood vessels.
   b. osteocytes.
   c. spongy bone.
   d. red bone marrow.

   ANS: A DIF: 1 OBJ: 45-2.2



14. Refer to the illustration above. Which of the following is the compact bone?
    a. 1
    b. 2
    c. 3
    d. 4

    ANS: B DIF: 1 OBJ: 45-2.2

15. Refer to the illustration above. The material labeled "1," which fills the center and spaces at the ends of bones and produces blood cells, is called
    a. exocrine material.
    b. cartilage.
    c. marrow.
    d. spongy bone.

    ANS: C DIF: 1 OBJ: 45-2.2

16. Refer to the illustration above. Structure 3 is a
    a. nerve.
    b. blood vessel.
    c. muscle.
    d. ligament.

    ANS: B DIF: 1 OBJ: 45-2.2

17. The heart and lungs are protected by the
    a. pectoral girdle.
    b. pelvic girdle.
    c. rib cage.
    d. periosteum.

    ANS: C DIF: 1 OBJ: 45-2.1

18. A person with a broken pelvis would probably be unable to
    a. walk.
    b. turn his or her head.
    c. raise his or her arm.
    d. bend his or her wrist.

    ANS: A DIF: 1 OBJ: 45-2.1

19. compact bone : periosteum ::
    a. periosteum : compact bone
    b. compact bone : spongy bone
    c. spongy bone : compact bone
    d. marrow : compact bone

    ANS: D DIF: 2 OBJ: 45-2.2

20. human skeleton : internal organs ::
    a. spoon : fork
    b. construction worker's hard hat : construction worker's head
    c. whisk broom : dust
    d. turnstile : a ticket

    ANS: B DIF: 2 OBJ: 45-2.1

21. In a fetus, most bones are originally made of
    a. red and yellow marrow.
    b. calcium phosphate.
    c. cartilage.
    d. osteopores.

    ANS: C DIF: 1 OBJ: 45-2.3

22. What is the difference between cartilage and bone?
    a. Cartilage contains cells that can continue to divide and grow, while bone does not.
    b. Cartilage is found only in the fetus, and bone is found only in children and adults.
    c. Bone contains significant mineral deposits between its cells, while cartilage does not.
    d. Bone contains dead cells, while cartilage contains living cells.

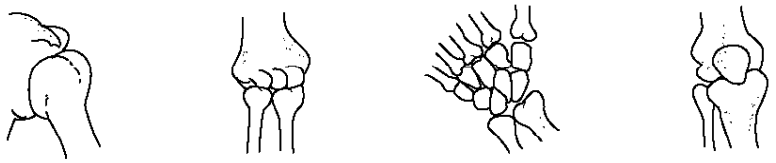
    ANS: C DIF: 1 OBJ: 45-2.3

23. Ligaments attach
    a. bone to bone.
    b. muscle to bone.
    c. muscle to muscle.
    d. cartilage to bone.

    ANS: A DIF: 1 OBJ: 45-2.4

24. The point where two or more bones meet is called a
    a. sprain.
    b. joint.
    c. point of intersection.
    d. growth region.

    ANS: B DIF: 1 OBJ: 45-2.4



25. Refer to the illustration above. Joint 1 is an example of a
    a. suture joint.
    b. ball-and-socket joint.
    c. pivot joint.
    d. plant joint.

    ANS: B DIF: 1 OBJ: 45-2.4

26. Refer to the illustration above. Joint 4 would most likely be found in the
    a. shoulder.
    b. elbow.
    c. knee.
    d. wrist.

    ANS: C DIF: 1 OBJ: 45-2.4

27. Refer to the illustration above. Which joint allows bones to glide over each other?
a. 1
b. 2
c. 3
d. 4

ANS: C DIF: 1 OBJ: 45-2.4

28. Refer to the illustration above. The elbow, a pivot joint that allows your hand to turn over, is shown in diagram
a. 1.
b. 2.
c. 3.
d. 4.

ANS: B DIF: 1 OBJ: 45-2.4

29. Degeneration of cartilage causes
a. menopause.
b. bone replacement.
c. bone fractures.
d. osteoarthritis.

ANS: D DIF: 1 OBJ: 45-2.5

30. The three types of muscles are
a. skeletal, smooth, and cardiac.
b. skeletal, voluntary, and cardiac.
c. smooth, cardiac, and involuntary.
d. skeletal, cardiac, and ridged.

ANS: A DIF: 1 OBJ: 45-3.1

31. Smooth muscle
a. can change the diameter of blood vessels.
b. moves food through the digestive tract.
c. is not under conscious control.
d. All of the above

ANS: D DIF: 1 OBJ: 45-3.1

32. Smooth muscle can be found
a. attached to the skeleton.
b. in the wrist bones.
c. at the knee joint.
d. in internal organs.

ANS: D DIF: 1 OBJ: 45-3.1

33. The region between Z lines is called the
a. myofibril.
b. sarcomere.
c. muscle fiber.
d. myosin filament.

ANS: B DIF: 1 OBJ: 45-3.2

34. Actin and myosin
a. are found in the sarcomeres.
b. are proteins.
c. interact during muscle contraction.
d. All of the above

ANS: D DIF: 1 OBJ: 45-3.2

35. Repeating units of myosin and actin filaments bound by two Z lines are
a. muscles.
b. myofibrils.
c. sarcomeres.
d. extensors.

ANS: C DIF: 1 OBJ: 45-3.2

36. It has been known for a long time that muscle contraction requires ATP. Recently, scientists have discovered that ATP is required in order for the muscle filaments actin and myosin to slide past each other, resulting in muscle contraction. The ATP is specifically required to release the attachments between actin and myosin in the many cycles of attachment, release, and reattachment that result in sliding of these filaments past each other. Which of the following phenomena is explained by this specific role of ATP?
a. muscle fatigue
b. stiffening of a body after death (rigor mortis)
c. opposing pairs of muscles functioning as flexors and extensors
d. muscle sprain

ANS: B DIF: 3 OBJ: 45-3.3

37. The total amount of force that a muscle exerts
a. is determined by the strength of the nerve impulse that caused the contraction.
b. depends on the total number of individual muscle fibers that have been stimulated.
c. depends upon the weight of the object being moved.
d. correlates to the number of Z lines contained within the sarcomeres of the muscle.

ANS: B DIF: 1 OBJ: 45-3.3

38. Muscle tissue functions to move
a. blood.
b. food in the digestive tract.
c. bones.
d. All of the above

ANS: D DIF: 1 OBJ: 45-3.1

39. Tendons connect
a. bone to bone.
b. muscle to bone.
c. muscle to muscle.
d. cartilage to bone.

ANS: B DIF: 1 OBJ: 45-3.4

40. A muscle can
a. push a bone.
b. pull a bone.
c. both push and pull a bone simultaneously.
d. sometimes push and sometimes pull a bone.

ANS: B DIF: 1 OBJ: 45-3.4

41. Muscles that bend joints are categorized as
a. flexors.
b. origins.
c. extensors.
d. insertions.

ANS: A DIF: 1 OBJ: 45-3.4

42. Muscles exert force by
   a. converting ADP and organic phosphate into ATP.
   b. interfering with the forces of gravity and friction.
   c. rapidly relaxing the muscle fibers.
   d. pulling on surrounding tissues.

   ANS: D DIF: 1 OBJ: 45-3.4

43. The insertion of a muscle
   a. is located on a bone that remains stationary when the muscle contracts.
   b. moves away from the origin during muscle contraction.
   c. is attached to the bone by a ligament.
   d. None of the above

   ANS: D DIF: 1 OBJ: 45-3.4

44. The origin of a muscle
   a. is at the opposite end of the muscle from the insertion.
   b. is located on a bone that remains stationary when the muscle contracts.
   c. does not move when the muscle contracts.
   d. All of the above

   ANS: D DIF: 1 OBJ: 45-3.4

45. flexors : bend ::
   a. immovable joints : bend
   b. slightly movable joints : be immovable
   c. extensors : straighten
   d. sutures : move a great deal

   ANS: C DIF: 2 OBJ: 45-3.4

46. The skin performs all of the following *except*
   a. protection.
   b. elimination of waste products.
   c. control of body temperature.
   d. production of chemical messengers.

   ANS: D DIF: 1 OBJ: 45-4.1

47. The functions of the skin include
   a. defense against microbes.
   b. regulation of body temperature.
   c. prevention of dehydration.
   d. All of the above

   ANS: D DIF: 1 OBJ: 45-4.1

48. Energy reserves are stored in the skin as
   a. fat cells.
   b. nerve tissue.
   c. keratin.
   d. lymph vessels.

   ANS: A DIF: 1 OBJ: 45-4.1

49. Keratin
   a. is a protein.
   b. fills dead cells in the dermis.
   c. is a skin pigment.
   d. All of the above

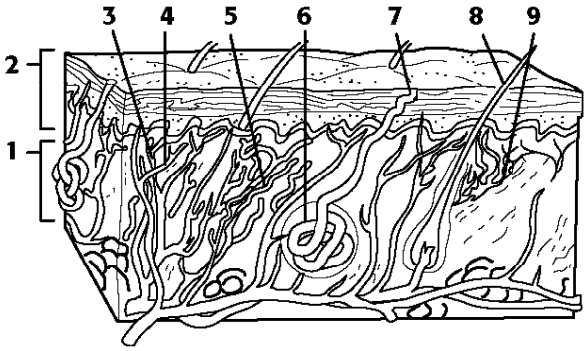
   ANS: A DIF: 1 OBJ: 45-4.1

50. The thin outer layer of the skin is
   a. the dermis.
   b. the epidermis.
   c. the fatty layer.
   d. connective skin.

   ANS: B DIF: 1 OBJ: 45-4.2

51. The dermis of the skin is
   a. composed of corneal and basal layers.
   b. the outer layer of the skin.
   c. the location of melanin.
   d. involved in temperature regulation.

   ANS: D DIF: 1 OBJ: 45-4.2



52. Refer to the illustration above. Which of the following structures is used to eliminate wastes and help regulate body temperature?
   a. 9
   b. 7
   c. 6
   d. 4

   ANS: B DIF: 1 OBJ: 45-4.3

53. Refer to the illustration above. Which of the structures in the diagram are composed mainly of dead cells?
   a. 1 and 6
   b. 2 and 8
   c. 3 and 4
   d. None of the above

   ANS: B DIF: 1 OBJ: 45-4.5

54. Refer to the illustration above. The portion of the skin labeled “1”
   a. is the dermis.
   b. is filled with keratin.
   c. is composed mainly of connective tissue.
   d. All of the above

   ANS: A DIF: 1 OBJ: 45-4.2

55. nail root : nails ::
   a. lunula : hair
   b. keratin : melanocytes
   c. melanin : hair
   d. hair follicle : hair

   ANS: D DIF: 1 OBJ: 45-4.4

56. A skin disorder caused by blockage of oil glands is called
a. acne.
b. carcinoma.
c. osteoporosis.
d. psoriasis.

ANS: A DIF: 1 OBJ: 45-4.3

COMPLETION

1. _____ tissue joins, supports, and protects other types of tissue.

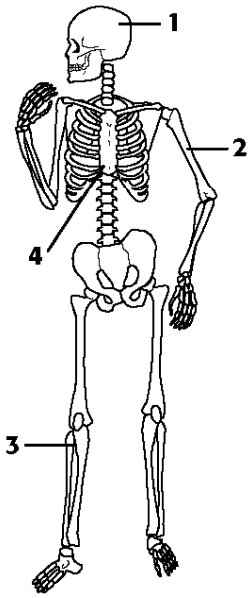
ANS: Connective

DIF: 1 OBJ: 45-1.1

2. The _____ is a wall of muscle that separates the thoracic and _____ cavities.

ANS: diaphragm, abdominal

DIF: 1 OBJ: 45-1.4



3. Refer to the illustration above. Bones 2 and 3 are part of the _____ skeleton.

ANS: appendicular

DIF: 1 OBJ: 45-2.1

4. Refer to the illustration above. Bones 1 and 4 are part of the _____ skeleton.

ANS: axial

DIF: 1 OBJ: 45-2.1

5. The bones of the skull and backbone are part of the _____ skeleton.

ANS: axial

DIF: 1 OBJ: 45-2.1

6. The bones of the arms, legs, and pelvis make up the _____ skeleton.

ANS: appendicular

DIF: 1 OBJ: 45-2.1

7. The _____ is a membrane that surrounds individual bones.

ANS: periosteum

DIF: 1 OBJ: 45-2.2

8. The _____ inside long bones is important in blood cell production and fat storage.

ANS: marrow

DIF: 1 OBJ: 45-2.2

9. The heart and lungs are protected by the _____.

ANS: rib cage

DIF: 1 OBJ: 45-2.1

10. The place where two bones meet is called a(n) _____.

ANS: joint

DIF: 1 OBJ: 45-2.4

11. _____ is a painful degeneration of movable joints caused by attacks on the joints by cells of the immune system.

ANS: Rheumatoid arthritis

DIF: 1 OBJ: 45-2.5

12. _____ tissue can be smooth, skeletal, or cardiac.

ANS: Muscle

DIF: 1 OBJ: 45-3.1

13. _____ muscle is found in the walls of many internal organs.

ANS: Smooth

DIF: 1 OBJ: 45-3.1

14. The proteins actin and _____ in muscles enable the cells to contract.

ANS: myosin

DIF: 1 OBJ: 45-3.2

15. Repeating units of actin and myosin filaments are called _____.

ANS: sarcomeres

DIF: 1 OBJ: 45-3.2

16. _____ are muscles that cause bones to bend at a joint.

ANS: Flexors

DIF: 1 OBJ: 45-3.4

17. Muscles that function to straighten a joint are called _____.

ANS: extensors

DIF: 1 OBJ: 45-3.4

18. Cords of connective tissue that attach muscles to bones are called _____.

ANS: tendons

DIF: 1 OBJ: 45-3.4

19. The brown pigment _____ determines skin color.

ANS: melanin

DIF: 1 OBJ: 45-4.1

20. Overexposure to _____ radiation may result in the mutations in skin cells that cause skin cancer.

ANS: ultraviolet

DIF: 1 OBJ: 45-4.1

21. The outermost layer of the skin is called the _____.

ANS: epidermis

DIF: 1 OBJ: 45-4.2

22. Hairs grow from specialized epidermal structures called hair _____.

ANS: follicles

DIF: 1 OBJ: 45-4.5

23. Acne is caused by overactive _____ and hormones.

ANS: oil glands

DIF: 1 OBJ: 45-4.3

PROBLEM

1. Connective tissue plays many different roles in the human body. It is crucial for providing structural support for the body. It provides protection for internal organs. It facilitates the movements of body parts. It functions in the transport of substances throughout the body. It serves a storage function for certain kinds of molecules. It also plays a vital role in enabling the body to defend itself against invading organisms or other foreign substances.

In the space below, write a short essay that first identifies the connective cell types discussed in your text. Next, distinguish these cell types from each other by their physical characteristics and by the type of matrix in which the cells are embedded. Finally, relate the physical characteristics and the type of intercellular matrix to the specific function(s) that each of these cell types performs.

ANS:
The students' essays should include the following information: Bone is a kind of connective tissue that contains cells embedded in a hard, crystalline matrix containing calcium. This type of matrix makes bone rigid and thus well suited for providing structural support and protection of internal organs. For example, the skull protects the brain, the rib cage protects the heart and lungs, and the pelvic and abdominal cavities protect organs of the reproductive, digestive, and excretory systems. Cartilage is a kind of connective tissue that contains cells embedded in a semisolid, fibrous matrix. This structure makes cartilage strong yet flexible. Cartilage provides some structural support, particularly in young humans and at stress points between adjacent bones. Ligaments and tendons are both tough, fibrous connective tissue, also with a semisolid, fibrous matrix. Ligaments connect bones to each other at joints and tendons attach muscles to bones. Both help the body make skeletal movements. Fat tissue, which also has a semisolid matrix, is a kind of connective tissue that contains cells that store fat as an energy reserve. Blood is a kind of connective tissue that contains cells embedded in a liquid matrix. Blood is the medium in which nutrients and wastes are transported to and from the cells of the body. Some of the blood cells function as part of the immune system to defend our bodies against invading organisms and foreign substances.

DIF: 3 OBJ: 45-1.1

ESSAY

1. Give an example of each of the following types of tissue, and briefly describe its functions: epithelial tissue, muscle tissue, connective tissue, and nervous tissue. Write your answer in the space below.

   ANS:
   Epithelial tissues, such as skin, are generally flat sheets of cells that protect from damage and control water loss in the tissues that they cover. Muscle tissue moves the body (skeletal muscle) and moves materials through the body (heart, smooth muscle of digestive tract). Connective tissue defends the body from invaders (white blood cells), stores materials (fat), and supports the body (bone and cartilage). Nervous tissues (brain, spinal cord, nerves) carry information in the form of electrical impulses.

   DIF: 1 OBJ: 45-1.1

2. List five types of freely movable joints in your body, and give a location for each. Write your answer in the space below.

   ANS:
   The shoulder and hip are ball-and-socket joints. The top two vertebrae of the spine form a pivot joint, allowing the head to turn from side to side. Gliding joints are found in the feet. The base of the thumb is a saddle joint. The knee is an example of a hinge joint.

   DIF: 1 OBJ: 45-2.4

3. Using examples, describe the three basic types of joints and their primary functions. Write your answer in the space below.

   ANS:
   Fixed joints are very tight joints that hold adjacent bones together, permitting no movement. The cranial bones of the skull are held together by fixed joints. Limited mobility is permitted by semi-movable joints, the second basic type of joint. In these joints, a bridge of cartilage joins two bones together, as in the joints between the vertebrae of the spine. The third type of joint is the freely movable joint. These joints allow the greatest degree of movement; they are found between bones that are held together by ligaments.

   DIF: 1 OBJ: 45-2.4

4. What is a ligament? Write your answer in the space below.

   ANS:
   A ligament is a tough connective tissue that joins one bone to another.

   DIF: 1 OBJ: 45-2.4

5. List the three types of muscle tissue, and give the function of each. Write your answer in the space below.

   ANS:
   The three types of muscle are skeletal muscle, cardiac muscle, and smooth muscle. Skeletal muscle moves bones, and cardiac muscle pumps blood through the body. Smooth muscle moves food through the digestive tract and is also found in the uterus, the bladder, and the blood vessels.

   DIF: 1 OBJ: 45-3.1

6. Describe the function of sliding filaments in the contraction of muscles. Write your answer in the space below.

   ANS:
   Myosin and actin filaments lie in parallel lines along the length of a myofibril in units called sarcomeres. The myosin heads touch the adjacent actin filaments. When a muscle contracts, the myosin heads attach to the actin filaments, and when the heads bend inward, they pull the actin filaments along with them toward each other. Muscle contraction requires energy supplied by ATP. As the actin filaments move toward each other along the myosin filament, they pull their Z lines with them, thus shortening the sarcomere. As sarcomeres are shortened along the entire muscle fiber, the muscle contracts.

   DIF: 2 OBJ: 45-3.3

7. What causes acne? Write your answer in the space below.

   ANS:
   Acne is caused by hormones and an increase in oil production by glands during adolescence. Excessive oil production can clog the oil glands, causing a buildup of oil.

   DIF: 1 OBJ: 45-4.3

8. What is muscle fatigue? What causes it? Write your answer in the space below.

   ANS:
   Muscle fatigue is the physiological inability of a muscle to contract and is a result of the depletion of ATP. When ATP is depleted, a state of continuous contraction occurs.

   DIF: 1 OBJ: 45-3.5