Multiple Choice:

1. When the arrector pili muscles contract
   a. sweat is released from sweat glands
   b. hairs are shed
   c. “goose bumps” form as our body attempts to raise hairs
   d. shivering occurs
   e. the skin changes color

2. Myoglobin:
   a. breaks down glycogen.
   b. is a protein involved in the synthesizing ATP from creatine phosphate.
   c. holds a reserve supply of oxygen in muscle cells.
   d. produces the action potential in the sarcolemma.
   e. causes the release of calcium from the sarcoplasmic reticulum.

3. The epidermis consists of four distinct layers of cells, each with a distinct role to play in the functioning of the skin. Which of the following layers is MOST responsible for cell division and replacement?
   a. stratum corneum
   b. stratum granulosum
   c. stratum basale
   d. stratum basale
   e. none of the above
   
4. A muscle contraction that generates tension but no shortening is:
   a. isotonic
   b. isophasic
   c. isometric
   d. isomuscular
   e. impossible

5. The interphalangeal joints are an example of a(n):
   a. saddle joint
   b. gliding joint
   c. ball-and-socket joint
   d. hinge joint
   e. pivot joint

6. The skin synthesizes vitamin D, which is critically important for proper bone and muscle function because vitamin D is directly necessary for
   a. proper absorption of calcium by the lining of the digestive tract.
   b. releasing calcium for use inside muscles in response to a stimulus.
   c. calcium uptake by bone, because it stimulates osteoblasts
   d. stimulating release of neurotransmitters from neurons
   e. none of the above
7. The movement that is exemplified by a ballerina pointing her toes is
   a. circumduction  
   b. eversion  
   c. inversion  
   d. plantar flexion  
   e. dorsiflexion

8. At rest, the tropomyosin molecule is held in place by
   a. actin molecules  
   b. myosin molecules  
   c. troponin molecules  
   d. ATP molecules  
   e. calcium ions

9. Which of the following has an ATPase which functions during the contraction cycle of muscle?
   a. actin molecules  
   b. troponin molecules  
   c. tropomyosin molecules  
   d. myosin heads  
   e. the tail portion of the myosin molecule

10. A muscle cell that is stimulated so frequently that the relaxation phase is completely eliminated is said to exhibit
    a. graded response  
    b. tetany  
    c. treppe  
    d. motor unit summation  
    e. recruitment

11. Which is true of the papillary layer of the dermis?
    a. rich in blood vessels  
    b. rich in nerve endings  
    c. composed mainly of dead cells  
    d. forms melanin pigments  
    e. a and b

12. Which structures are dermal derivatives?
    a. sweat glands  
    b. fingernails  
    c. hairs  
    d. all of the above are correct  
    e. none of the above are correct

13. Acetylcholinesterase:
    a. is found in the sarcolemma at neuromuscular junctions  
    b. is necessary to prevent prolonged contractions  
    c. breaks down acetylcholine  
    d. is responsible for beginning the electrical impulse  
    e. all but d. are correct

14. Synovial joints are freely moveable joints, which means they could be called:
    a. synchondroses  
    b. symphyses  
    c. amphiarthrotic joints  
    d. synarthrotic joints  
    e. diarthrotic joints
15. Put the following in order of use in a muscle that is beginning to work lightly.
   1. aerobically produced ATP
   2. anaerobically produced ATP
   3. stored ATP
   4. ATP from phosphorylation by creatine phosphate
   a. 1 - 2 - 3 - 4  
   b. 3 - 1 - 4  
   c. 3 - 4 - 2 - 1  
   d. 3 - 4 - 1  
   e. 1 only

16. The movement required by the leg (knee) to move from sitting to standing is:
   a. abduction  
   b. flexion  
   c. adduction  
   d. extension  
   e. circumduction

17. The layer of connective tissue that surrounds an individual muscle fiber is called:
   a. perimysium  
   b. epimysium  
   c. endomysium  
   d. fascia  
   e. sarcomysium

18. The synaptic vesicles of axonal terminals at neuromuscular junctions contain:
   a. potassium  
   b. acetylcholinesterase  
   c. acetylcholine  
   d. calcium  
   e. ATP

19. The fibrous protein that is responsible for the strength and in part for the water resistance of the epidermis is
   a. collagen  
   b. reticular  
   c. keratin  
   d. elastin  
   e. glycolipids

20. Third class levers work
   a. with the effort applied in the middle  
   b. with the load placed in the middle  
   c. at a mechanical disadvantage  
   d. both a and c  
   e. both b and c

21. Connective tissue sacs lined with synovial membrane that act as cushions in places where friction develops are called:
   a. articular cartilages  
   b. symphyses  
   c. ligaments  
   d. tendons  
   e. bursae
22. Theoretically, if a muscle were stretched to the point where thick and thin filaments no longer overlapped:
   a. maximum force production will result since the muscle has a maximum distance to contract.
   b. no muscle tension could be generated.
   c. cross bridge attachment would be optimum because of all the free binding sites on actin
   d. ATP use would increase since the sarcomere is "trying" to contract.

23. The position of the T tubules is important because
   a. it allows the depolarization of the action potential to affect the ion permeability of the membranes of the sarcoplasmic reticulum
   b. it allows calcium to enter much more readily from the extracellular fluid
   c. the depolarization wave directly causes the actin to change shape
   d. it allows the acetylcholine to penetrate deeply into the muscle cell
   e. prevents the action potential from overwhelming the muscle cell

24. Which of the following does not occur during growth of long bones?
   a. The compact bone portion becomes thicker due to osteoblast activity
   b. During adolescence, sex hormones increase bone growth rate
   c. The marrow cavity enlarges due to osteoclast activity in the endosteum
   d. The epiphyseal plate activity increases the length
   e. Red bone marrow distribution increases as the long bones reach their final length

TRUE-FALSE:

25. The depolarization wave (sodium rushing in) is what, in turn, opens both more sodium gates and (where needed) calcium gates.

26. Parathyroid hormone stimulates osteoblasts to break down bone, releasing calcium into the blood.

27. The effect of the neurotransmitter on the muscle cell membrane is to modify its permeability properties temporarily.

28. The inorganic components of bones are responsible for the hardness of the bones, and makes up around two-thirds of the entire mass of the bone.

29. A nerve cell and all the muscle cells it stimulates are referred to as a neuromuscular junction.

30. Articular cartilages can act as a reservoir for synovial fluid in synovial joints.
31. Melanocytes are found in the deepest layer of the epidermis.

32. Spongy bone significantly reduces the structural integrity of living bones.

33. During isotonic contraction, the heavier the load, the slower the velocity of contraction.

34. Hormonal remodeling is the most important mechanism for maintaining the health of the bones.

MULTIPLE CHOICE (again!):

35. The main function of the sarcoplasmic reticulum in muscle contraction is to
   a. make and store creatine phosphate
   b. regulate intracellular calcium concentration
   c. Provide a source of ATP for the contraction process
   d. Synthesize actin and myosin myofilaments
   e. Initiate the action potential

36. Each muscle cell contraction
   a. shortens the muscle cell only about 1%
   b. involves many cycles of myosin head attachment and detachment
   c. involves only a few of the sarcomeres in the muscle cell
   d. can occur in the absence of ATP
   e. can occur spontaneously, without an action potential (electrical impulse)

MATCHING: Answers may be used more than once or not at all.

Joint Action: Match the action with the appropriate term. Answers may be used more than once or not at all.

37. Movement of mandible as you clench your teeth (from open position)  a. Elevation
   b. Depression
   c. Flexion

38. Movement of hip as you kick a ball  d. Extension
   e. Hyperextension

39. Movement of forearm to put your hand(palm) flat against your hip (from anatomical position)  a. Supination
   b. Pronation
   c. Abduction
d. Adduction

40. Shrugging the shoulders
(41 - 46) For each of the following, mark "A" if the left hand item is greater, "C" if the right hand item is greater, "B" if the two items are equal, or "D" if not enough information is given.

A. Left is greater
B. Items are equal
C. Right is greater
D. Not enough information given

41. Number of oxidative fibers in leg — Number of fast glycolytic fibers in leg muscles of a world-class marathoner — muscles of the same marathoner

42. Number of axes of movement for — Number of axes of movement for ball-hinge joints — and-socket joints

43. Number of Langerhans’ cells in — Number of Langerhans’ cells in stratum basale — stratum spinosum

44. Sebum production in presence of sex — Sebum production in absence of sex hormones, particularly testosterone — hormones

45. Calcium inside sarcoplasmic reticulum — Calcium inside sarcoplasmic reticulum in a muscle cell at rest — in the same muscle cell when active

46. (In females before menopause) Growth period for eyelash follicles — Growth period for top of head follicles

Fill-in-the-Blank:

47. The long, cylindrical superorganelles of the muscle cell, each containing numerous sarcomeres, are called _________________.

48. Most sweat glands are _______________ glands (as opposed to apocrine glands) and secrete “typical” sweat; these are found in most parts of the body.

49. The attachment point of a muscle to the more movable bone is that muscle’s point of _________________.

50. A _________________ is a fibrocartilage pad between two articulating bone surfaces.
SHORT ANSWER: Answer Question A and one other, or answer any other three of the following.

A. Put the following events in the correct order. (5 points)
   1. Action potential is initiated in the sarcolemma and travels down the T-tubules.
   2. Action potential travels down the motor neuron.
   3. Calcium binds to troponin, which moves tropomyosin.
   4. Calcium enters the axon terminal.
   5. Acetylcholine attaches to sarcolemma.
   6. Acetylcholine is released from the nerve endings at the neuromuscular junction.
   7. Myosin detaches from the actin, and the heads return to their cocked position.
   8. Myosin heads attach to the exposed active sites on the thin (actin) filaments.
   9. Calcium is released into the cytoplasm of the muscle fiber.
   10. The myosin heads pull on the thin filaments (power stroke).

B. Describe the following as they apply to the dermis: flexure lines, tension lines (2 pts.)

C. Name one type of arthritis and it's main cause. (2 pts.)

D. What are the two ways to generate graded whole-muscle contractions? (2 pts.)

E. There are two major methods of bone formation. Name the method that is used in the formation of the following: long bones, flat bones. (2 pts.)

F. Define/Describe the following as they refer to hair: vellus, root hair plexus. (2 pts.)
G. What is meant by the statement "a muscle cell is always ready to contract:"? (2 pts.)

H. Explain rigormortis. Include three things that happen in the muscle that make it stiffen up in the absence of ATP. (3 pts.)

I. An individual osteon is extremely resistant to stresses placed upon it from any angle. Describe how the arrangement of collagen fibers within an osteon allows an osteon to resist such stresses. (2 pts.)