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Part II. [38 points]: Choose the one BEST answer. Circle its letter, write it in the blank, or fill in the blank, as indicated. Read each question and **all the choices** carefully because more than one answer might seem correct at first glance. For the non-standard questions, **read instructions carefully!** *1 pt each*

1. The smallest unit of contraction in skeletal muscle is
 - a. sarcomere
 - b. motor unit
 - c. myofiber
 - d. thin filament
 - e. synapse
2. Sac-like structures that reduce friction between body parts at joints are
 - a. fat pads
 - b. fibrous capsule
 - c. ligaments
 - d. bursae
 - e. synovial capsule
3. The muscle shape in which fascicles are arranged at an oblique angle to the tendon is
 - a. parallel
 - b. convergent
 - c. pennate
 - d. circular
 - e. compound
4. The perimysium wraps a(n)
 - a. entire muscle
 - b. group of muscles that function together
 - c. myofiber
 - d. myofibril
 - e. fascicle
5. Function of the medial and lateral menisci include all of the following EXCEPT
 - a. stabilize joint
 - b. cushions between articular surfaces
 - c. conforms to articulating surfaces as the femur moves
 - d. guides the bones and prevents dislocation
 - e. limit the anterior and posterior movement of the femur on the tibia
6. A motor unit is
 - a. all the muscle fibers within a given muscle
 - b. a motor neuron and the muscle fibers it innervates
 - c. all the neurons going into an individual section of the body
 - d. a fascicle and a nerve
 - e. the sarcoplasmic reticulum
7. The presence of blood in a spinal tap (fluid removed from around the spinal cord) from a patient suffering from a closed head wound, is most likely a result of bleeding into the
 - a. epidural space
 - b. subarachnoid space
 - c. subdural space
 - d. subarachnoid space
 - e. periosteum
8. Uniaxial joints include
 - a. pivot joints
 - b. hinge joints
 - c. symphyses
 - d. a and b
 - e. all of the above
9. Ribs are elevated by the
 - a. diaphragm
 - b. external intercostals
 - c. internal intercostals
 - d. transversus thoracis
 - e. serratus posterior inferioris
10. The part of the nervous system that controls the function of the visceral organs, and over which we usually

have no control is the _____ (nervous) system

- a. autonomic
- b. somatic sensory
- c. visceral sensory
- d. somatic motor
- e. central

11. Muscles

- a. pull; they don't push
- b. are generally organized in layers as part of the body plan
- c. contract with force
- d. a and b
- e. all of the above

12. All of the following muscles originate on the scapula EXCEPT

- a. brachialis
- b. coracobrachialis
- c. biceps brachii
- d. deltoid
- e. none of the above—all of these muscles originate on the scapula

13. Cerebrospinal fluid production involves all of the following participants and locations, EXCEPT

- a. by ependyma
- b. by meninges
- c. by choroid plexi
- d. in brain ventricles
- e. none of the above - ALL participate

14. The power exerted by a muscle depends on

- a. fiber length
- b. total cross-sectional area
- c. fascicular arrangement
- d. twitch (fast, slow)
- e. all of the above

15. Nissl bodies are located throughout the neuron except at the _____.

- a. cytoplasm
- b. dendrites
- c. axon
- d. perikaryon
- e. none of the above - they are found in all these regions

16. Clenching the teeth is

- a. elevation
- b. depression
- c. extension
- d. mastication
- e. subluxation

17. A neuron that conducts nerve impulses from the body to the central nervous system is a(n):

- a. afferent neuron
- b. efferent neuron
- c. interneuron
- d. motor neuron
- e. it could be any of the above - more information is needed

18. Flexor carpi ulnaris acts to

- a. flex the wrist
- b. abduct the hand
- c. adduct the hand
- d. a and c
- e. a and b

19. The primary vesicle that does not develop into two secondary vesicles is the

- a. prosencephalon
- b. mesencephalon
- c. telencephalon
- d. rhombencephalon
- e. metencephalon

20. When a skeletal muscle contracts (ordinarily)

- a. its insertion is pulled toward its origin
- b. the origin is pulled toward the joint

- c. its insertion is pulled toward its ligament
 - d. muscle tissue dies and re-grows
 - e. the origin is pulled toward its insertion
21. All of the following are dense regular fibrous connective tissue EXCEPT
- a. retinaculum
 - b. aponeurosis
 - c. tendon
 - d. fascia
 - e. ligament
22. Blockage of CSF flow in the cerebral aqueduct (of Sylvius) would be expected to affect all of the following EXCEPT
- a. interventricular foramina (of Monro)
 - b. fourth ventricle
 - c. third ventricle
 - d. all of the above WOULD be affected
 - e. none of the above would be affected
23. An agonist and its antagonist
- a. are usually located on the same side of a bone
 - b. are usually located on the lateral and medial sides of a bone
 - c. are usually located on opposite sides of a bone
 - d. locations vary too much to generalize
 - e. can not be discussed without knowing the specific case
24. All of the following are true of meninges EXCEPT
- a. the cranial dura mater has two layers
 - b. the spinal dura mater has a single layer
 - c. there is no epidural space around the brain
 - d. the cranial and spinal meninges are continuous (with each other)
 - e. none of the above are false, all are true
25. Structures that reduce friction around joints are
- a. tendon sheaths
 - b. bursae
 - c. articular disks
 - d. menisci
 - e. a and b
 - f. c and d
 - g. all of the above
26. Most of the cerebrospinal fluid is found in the
- a. dural sinuses
 - b. choroid plexus
 - c. subarachnoid space
 - d. epidural space
 - e. ventricles
27. The superior side of the foot is
- a. the dorsum
 - b. plantar
 - c. the calcaneus
 - d. the extensor digitorum longus
 - e. only found in bipedal organisms such as humans, not in cats and other four-legged animals
28. Gray matter typically contains
- a. dendrites
 - b. neuronal cell bodies
 - c. axons
 - d. neuroglia
 - e. all of the above
29. Nodes of Ranvier
- a. are small spaces interrupting the myelin sheath between adjacent neurolemmocytes
 - b. are small spaces interrupting the myelin sheath between adjacent oligodendrocytes
 - c. permit rapid electrical conduction along a nerve cell process
 - d. a and b
 - e. all of the above
30. Cerebrospinal fluid
- a. provides liquid cushion to protect the brain from sudden movements and shocks
 - b. circulates through ventricles in the brain
 - c. is produced by the choroid plexus in cranial dura septa

- d. a and b
 - e. all of the above
31. The joint which is very easy to dislocate, and is a combination gliding and hinge is the ____ joint
- a. glenohumeral
 - b. talocrural
 - c. temporomandibular
 - d. coxal
 - e. sternoclavicular
32. All of following is are synarthroses EXCEPT
- a. suture
 - b. syndesmosis
 - c. gomphosis
 - d. synchondrosis
 - e. epiphyseal plate
33. Structures that reduce friction inside joints are
- a. tendon sheaths
 - b. bursae
 - c. articular disks
 - d. menisci
 - e. a and b
 - f. c and d
 - g. all of the above
34. Neuroglia that regulate the composition of cerebrospinal fluid are
- a. astrocytes
 - b. oligodendrocytes
 - c. dendrites
 - d. microglia
 - e. ependyma
35. Moving the thigh forward at the hip, as in climbing stairs (stepping up), is
- a. extension
 - b. flexion
 - c. adduction
 - d. abduction
 - e. rotation
36. CSF is produced by
- a. choroid plexus
 - b. ependymal cells working with capillaries
 - c. arachnoid villi
 - d. a and b
 - e. all of the above
37. Structures that reduce friction around joints are
- a. tendon sheaths
 - b. bursae
 - c. articular disks
 - d. menisci
 - e. a and b
 - f. c and d
 - g. all of the above
38. At the wrist and ankle, the deep fascia is thickened into fibrous bands called
- a. pollicis
 - b. digiti minimi
 - c. expansion
 - d. retinaculum
 - e. fascicles

BONUS: WRITE A QUESTION THAT YOU STUDIED FOR, AND FORGETFUL ME, I NEGLECTED TO ASK. ANSWER YOUR QUESTION. PLEASE ASK YOURSELF SOMETHING YOU CAN ANSWER WELL! PLEASE ANSWER THE QUESTION YOU ACTUALLY ASK. [UP TO 5 POINTS AWARDED BASED ON QUESTION & ANSWER] YOU MAY ANSWER ONE ADDITIONAL QUESTION IN PART II *INSTEAD*.

Part II. [20 points]: Fill in the blanks, with your own words or from the choices give, as indicated. Be sure to use the proper terminology *1 pt each*

1. - 3. Choose from the list (use the same key):

- | | |
|--|---------------|
| 1. ____ cell in nervous tissue which acts as a switch & wire | a. dendrite |
| 2. ____ contains the nucleus and all other organelles of a neuron | b. glia |
| 3. ____ cell in nervous tissue which serves one of several support functions | c. neuron |
| | d. axon |
| | e. perikaryon |

4. - 8. Match the supporting (glial) cells with its function (use the same key):

- | | |
|-------------------------|---|
| ____ 4. astrocyte | a. form myelin sheaths in CNS |
| ____ 5. satellite cell | b. controls transfer of materials from capillary blood to neurons |
| ____ 6. microglial cell | c. form myelin sheaths in PNS |
| ____ 7. oligodendrocyte | d. engulf invading microorganisms & dead neurons |
| ____ 8. Schwann cell | e. support cell bodies within ganglia in PNS |

____ 9. Which muscle tissue is found in the walls of hollow internal structures such as blood vessels, stomach, intestines, gonadal ducts, etc.

10. Which three muscles in cat correspond to the trapezius in humans?

____ 11. The plural of diarthrosis

____ 12. Which lever(s) always works at a mechanical disadvantage? (I, II, III - as many as you choose)

____ 13. Name a skeletal muscle that does not insert or originate on any bone

____ 14. What property is unique to skeletal muscle and cardiac muscle?

____ 15. An adjective that means slightly moveable

____ 16. A noun that means a slightly moveable joint

17. - 20.

	CNS	PNS
cluster of cell bodies		
cluster of neuron processes (axons and/or dendrites)		

Part III: [12 points]: Choose 2 (omit 3). *6 points each.*

1-2. [You must do all of this, or if omitted, it counts as 2 omits.] Use the key at the right to fill in the blanks. If you feel it necessary, you may explain any answer more fully.

- | | |
|--------------------------|---|
| ____ striated | a. skeletal muscle |
| ____ voluntary | b. cardiac muscle |
| ____ irritable | c. smooth muscle |
| ____ extensible | d. skeletal muscle & cardiac muscle |
| ____ central nuclei | e. skeletal muscle & smooth muscle |
| ____ intercalated disks | f. cardiac muscle & smooth muscle |
| ____ syncytium | g. skeletal muscle & cardiac muscle & smooth muscle |
| ____ sarcomeres | h. no muscle tissue |
| ____ mesodermal | |
| ____ not elastic | |
| ____ can pull with force | |
| ____ can push with force | |

3. Describe the route of cerebrospinal fluid from where it is made to where it leaves the central nervous system. Be sure to name the specific structures it passes through or around. What is its function?

4. List and describe the meninges, and the spaces between them; be sure to note and explain the difference(s) between spinal and cranial meninges. A description of a structure includes where it is, of what it is made, and its function. A description of a space includes where it is, whether it is real or potential, what fills it, and its function.

5. Describe a “typical” synovial joint, and diagram its components. Be sure that you have not drawn a specific joint, but rather, a general sketch that could represent any synovial joint structure. One way to answer this is to describe, briefly, the function of each labeled part. *Bonus: on a separate sketch, include menisci; where are they found? what are they made of? what are they for?*

Part IV. [55 points] Variable points per question. Answer ALL of the questions in this part. Be brief, focused, and complete. A drawing may help *illustrate* a point. However, a drawing by itself is NOT an explanation - **be sure to state what you are trying to illustrate!**

1. [7 pts] The sarcomere region(s) which [fill in ALL the correct letters - there may be more than one letter per blank]

- _____ shorten during contraction
- _____ contain only actin
- _____ contain myosin
- _____ contain only myosin
- _____ contain actin
- _____ contain neither actin nor myosin
- _____ contain both actin and myosin

- A. A band
- H. H zone
- I. I band
- M. M-line
- Z. Z-disc or Z-line
- X. none of the above

OR Draw a sarcomere in a noticeably more and a noticeably less extended state. Label all the components, and briefly explain the how a sarcomere fits into the overall structure of a myofiber.

2-4. [30 pts @ 10 points each lever system] Choose a pair of motions *which occur at the same site in the body, that is, at the same joint, moving the same body part, or using the same set of muscles*, which demonstrates two distinct lever systems. Describe the motions, and describe the lever systems fully and completely.

You might choose to use one of the following two examples, or some other of your own preference:

- (a) two lever systems are used to plantar flex the foot depending on whether the foot is free or resting on a solid surface (pointing the toes versus standing on toes).
- (b) Two distinct lever systems are employed in order to flex and extend the forearm, respectively.

AND Choose a **third** motion which demonstrates the third class of lever (whichever was left out, above).

For each movement: Describe the system fully.

REMEMBER TO DO 3!

- (a) sketch the lever system, showing - and labeling (by proper name): the primary skeletal elements and the agonist (the "main mover")
- (b) indicate the position of the fulcrum, "effort", and "resistance" or "load" positions and directions that effort is applied and that the load or resistance *is moved* by that effort
- (c) name the primary antagonist (main muscle opposing the agonist)
- (d) name at least two synergists and *explain the synergy*. (is a synergist acting directly or indirectly? Explain.)
- (e) remember to label the sketch: which lever are you illustrating? & what movement have you chosen for that demonstration? Be sure to label the 3 components of the lever on your sketch, as well as labeling the anatomical components with their proper names.
- (f) include any explanation needed to clarify your demonstration. A labeled diagram alone is NOT sufficient!