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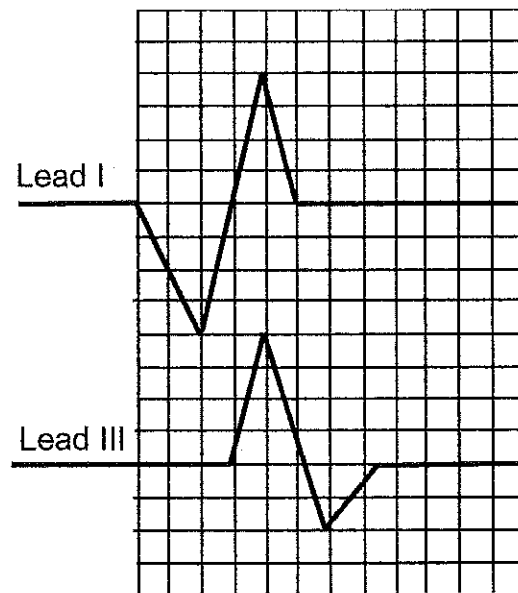
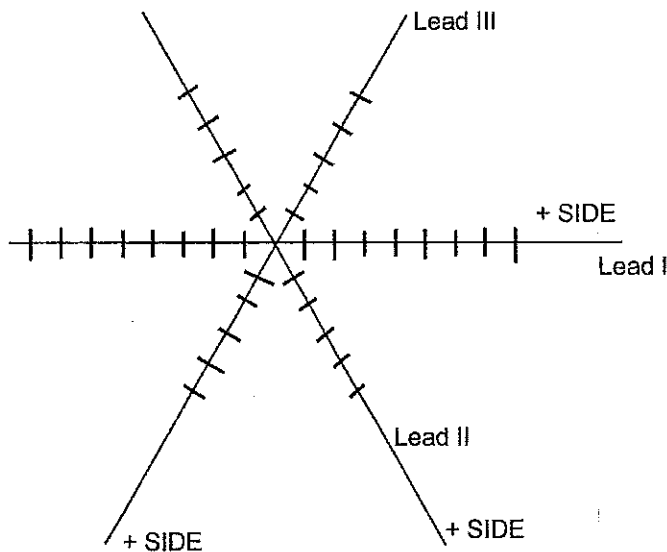
A total of 106 points are possible

Multiple choice

1. Hypothalamic neurons release _____ into capillaries.
 - A. Oxytocin and prolactin
 - B. ADH and prolactin
 - C. prolactin and GH
 - D. ADH and oxytocin
 - E. ADH and Thyroid hormone
2. Which of the following endocrine glands is a modified sympathetic ganglia?
 - A. islets of Langerhans
 - B. adrenal medulla
 - C. pars nervosa
 - D. parafollicular cells
 - E. adrenal cortex
3. Which of the following is a physiological example of positive feedback control of a hormone's action?
 - A. The effect of the baby suckling the nipple on oxytocin release
 - B. The effect of cortisol feedback on the hypothalamic secretion of corticotropin-releasing hormone (CRH)
 - C. The effect of uterine stretch receptors on oxytocin after parturition
 - D. The effect of high testosterone levels on the secretion of lutenizing hormone from the pituitary
4. A recent study found that the blood pressure in a person is 140/50 mm Hg. Approximately, what is the mean arterial pressure of this person?
 - A. 90 mm Hg
 - B. 80 mm Hg
 - C. 70 mm Hg
 - D. I cannot approximate mean arterial pressure with the information given.
5. Steroid hormones are derived from:
 - a. Cholesterol
 - b. Tyrosine
 - c. Triglycerides
 - d. Vitamin D
6. The pressure in the left ventricle is greatest during which phase of the cardiac cycle?
 - a. Atrial systole
 - b. Isovolumetric contraction
 - c. Ventricular ejection
 - d. Ventricular filling
7. Regulation of the resistance of blood vessels is under the control of:
 - a. Growth of new blood vessels
 - b. The amount of collagen in the wall of the vessel
 - c. Autonomic nervous system regulation of smooth muscle cell contraction
 - d. Hypothalamic regulation of the autonomic nervous system
8. The pacemaker potential (slow depolarization) of the human heart is caused by:
 - a. Funny Na⁺ channels and T-type Ca²⁺ channels
 - b. Voltage-gated Ca²⁺ channels
 - c. Leaky K⁺ channels
 - d. Voltage-gated Na⁺ channels

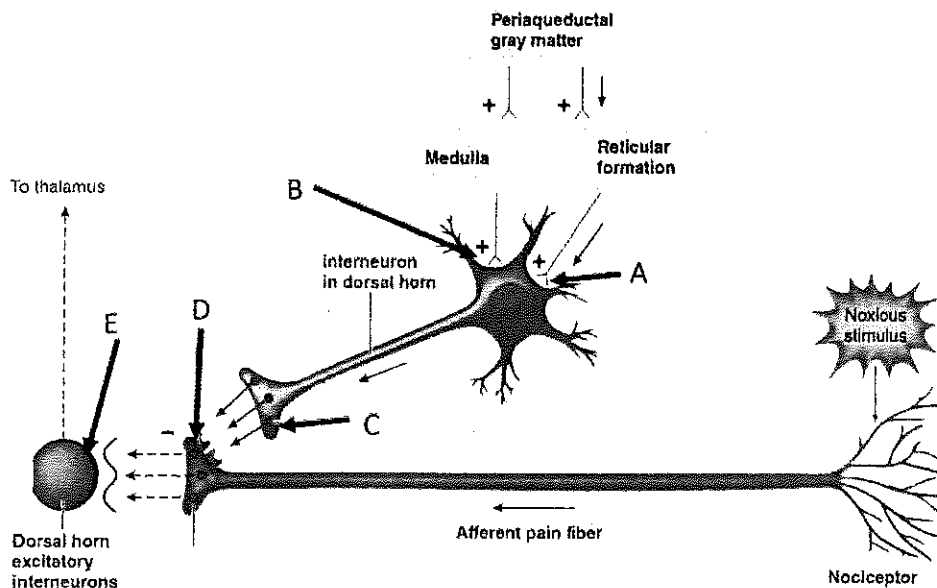
9. Arthropod muscle differs from vertebrate muscle in that
- A. a single muscle fiber may be innervated by multiple motor neurons.
 - B. a single motor neuron forms multiple synapses (multiterminal innervation) with a single muscle fiber.
 - C. development of muscle tension is modulated by inhibitory presynaptic inputs.
 - D. muscle fibers are innervated by both excitatory and inhibitory neurons.
 - E. All of these.
10. What is the primary target of action for GnRH?
- A. posterior pituitary
 - B. hypothalamus
 - C. anterior pituitary
 - D. Gonads
 - E. thyroid
11. If one injected in their body glucocorticoids every day for periods of months, what would be the likely scenario?
- A. The endogenous blood level of ACTH would increase.
 - B. The adrenal gland (cortex) may reduce in endogenous production and release of cortisol.
 - C. The anterior pituitary would grow
 - D. The pancreas would probably decrease in insulin release
 - E. Ca^{2+} levels in the blood would be increased.
12. The plateau phase of a cardiac muscle action potential in ventricular muscle is characterized mostly by:
- A. lacking a stable resting potential
 - B. elevated Na^+ flux
 - C. elevated K^+ flux
 - D. elevated Ca^{2+} flux
 - E. none of the above
13. The Frank-Starling mechanism relates to:
- A. pulmonary resistance
 - B. stroke volume
 - C. atrial mean pressure
 - D. impulse velocity
 - E. distensibility of the ventricular wall and contraction
14. A condition, such as elephantiasis, where severe edema occurs is most closely associated with which of the following ?
- A. low hydrostatic pressure in the veins
 - B. very high colloid osmotic pressure in the capillary
 - C. blockage of the lymphatic system so lymph cannot flow
 - D. an over production of NO locally producing vasodilatation
 - E. active use of skeletal muscle inhibiting lymph flow
15. Invertebrates with an open circulatory system can have arteries from the heart to direct blood to particular regions of the body. The statement above is-
- A. True
 - B. False
16. Which of the following capillary types is the least porous?
- A. Continuous
 - B. Sinusoidal
 - C. Fenestrated
 - D. splenic
 - E. hepatic

17. During the follicular phase of the ovarian (menstrual) cycle:
- Ⓐ. estrogen levels predominate
 - Ⓑ. progesterone levels predominate
 - Ⓒ. estrogen and progesterone levels are elevated
 - Ⓓ. estrogen and progesterone levels are low
 - Ⓔ. none of the above apply
18. Which of the following body part has the largest representation in the somato-sensory cortex in a human brain ?
- Ⓐ) the knee
 - Ⓑ) the hip
 - Ⓒ) the shoulder
 - Ⓓ) the face
 - Ⓔ) the back of the lower leg
19. The semicircular canals of the vertebrate inner ear are primarily responsible for which of the following functions?
- Ⓐ. equilibrium
 - Ⓑ. static position of the head
 - Ⓒ. hearing
 - Ⓓ. Sensing atmospheric pressure
 - Ⓔ. none of the above
20. Estimate the mean electrical axis as we did in class given the following information. (Terms are as we defined in class for EKG. Use grid marks as shown on graphs)

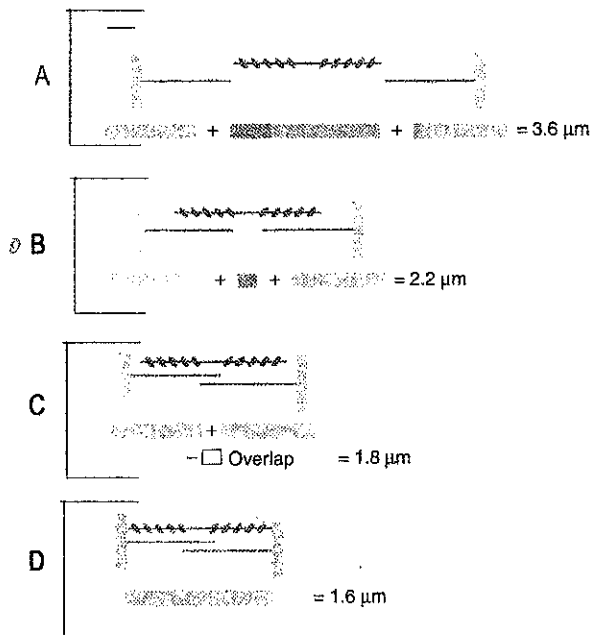
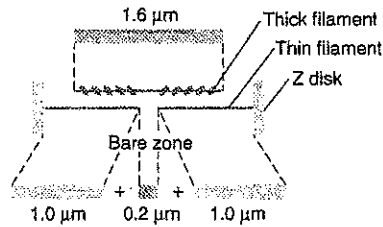


- Ⓐ. 60 degrees
- Ⓑ. 45 degrees
- Ⓒ. 90 degrees
- Ⓓ. 10 degrees
- Ⓔ. 180 degrees

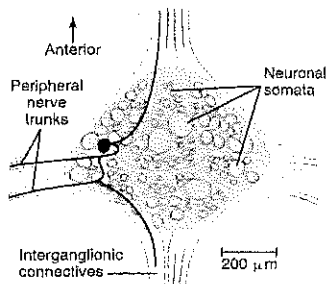
21. What developmental structures become the uterus and fallopian tubes in a human ?
- Leydig cells
 - Wolffian ducts
 - Sertoli cells
 - *D. Müllerian ducts
 - None of the above
22. The PR interval is determined primarily by the time it takes for the depolarization to **get to the AV node**.
- True
 - *B. False
23. Sonic (boat fish) and shaker muscles (rattlesnake), as we talked about in class, have which of the following properties?
- They don't require the calcium troponin binding step.
 - *b. They have a very good ability to pump and take up calcium from the myoplasm (cytoplasm) back into the SR (sarcoplasmic reticulum)
 - Contains very slow myosin ATPase activity
 - Allow calcium to be maintained at high level for prolonged periods of time in the myoplasm (cytoplasm).
 - They are not neurally innervated muscle fibers
24. In regards to taste perception, which of the following best describes the type of receptors present on the human tongue?
- All the receptors are ligand gated ion channels.
 - All the receptors are ion channels that are directly altered by a chemicals we taste.
 - Some of the chemicals we taste alter the capacitance of the neuron which inhibits the neuron.
 - Most of the chemicals directly block ion channels and cause a decrease in neuronal excitability.
 - *E. Some the chemicals bind to ligand gated receptors that are ion channels and they work through second messengers while other chemicals bind to ion channels and alter ion flux.
25. In the figure below in a diagram, of a mammal nervous system, which location are the OPIATE RECEPTORS located to regulate the sense of pain?
- A or B or C or D or E (fill in on Scantron sheet)**



26. In the figure below, which position of the sarcomere, will result in the maximum amount of active tension?



27. In regards to the leech ganglion that we discussed in class, which one(s) below apply:



- A. Helped in understanding the function of glia cells in buffering K^+ from active neurons
- B. Helped in understanding the regeneration and repair of the nervous system
- C. Helped in understanding how neural circuits function
- D. Helped in understanding the function of single identifiable neurons
- E. All of the above

28. The hominid skulls shown in the figure having varying brain size from the older fossils to modern man. What part of the brain do you think increased in size to correspond to the increase in skull size (hint: think of function associated with this part of the brain)?



- A. cortex associated with respiration
- B. olfactory cortex
- C. visual cortex
- D. frontal cortex
- E. brain stem

29. We perceive “taste” when we put food in our mouth but from the experiments that were conducted in the recitation with the candy “HOT TAMALES” (ones with cinnamon) , what did you learn (or at least what you were supposed to have learned)?

- A. That what we “see” alters our ability to taste the candy.
- B. That when we breath in through our nose, with aromatic food in our mouth, that the smell added to the sense of taste.
- C. That the touch of the food on our tongue made the food taste differently.
- D. That the hotness of the candy was due to the visual response seeing the red candy.
- E. That the pinching of our nose made us unaware that we were tasting something sense the stimuli were competing for each other.

30. Depolarization of the T tubule membrane and alteration of the dihydropyridine receptor causes mechanically-gated, calcium channels on the sarcoplasmic reticulum to

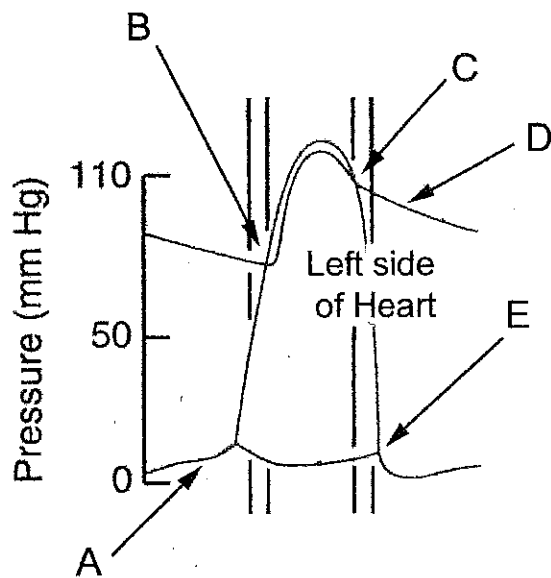
- a. open, leading to an elevation of cytoplasmic calcium levels.
- b. open, leading to a loading up of cytoplasmic calcium in the sarcoplasmic reticulum.
- c. close, reducing cytoplasmic calcium.
- d. close, preventing loading of calcium in the sarcoplasmic reticulum.
- e. bind ryanodine.

31. A postmortem biopsy of the brain was taken from a person infected with the RABIES VIRUS and the finding was, that even though the rabid dog bite occurred on the leg, the cell bodies of the motor neurons contained the rabies virus. Also particular areas of the brain, when examined, also showed the rabies virus in cell bodies, but predominantly in Ach containing neurons. What answer below would be most logical?

- A. The virus was taken up through a glia transport mechanism and then the glia cell transported the virus through gap junctions to the neurons.
- B. The virus is taken up by the acetylcholine transporter in the presynaptic nerve terminal and transported in a retrograde direction to the cell bodies.
- C. The virus was taken up in all neurons but selectively killed out in all neurons except for the ones containing Ach.
- D. The glia cells selectively take up the virus and then die. Since glia cells are only around Ach containing neurons, when the glia die these neurons are the only ones in close contact to take up the virus next.

32. In smooth muscle, the calcium causes a rise in intracellular concentration comes from?
- ECF
 - SR
 - mitochondria
 - A, B, and C
 - A and B
33. Which of the following creates a 'pressure reservoir' (maintains a mean pressure wave) within the circulatory system?
- large arteries
 - capillaries
 - veins
 - lymph vessels
 - valves
34. The primary force driving fluids to leak from capillaries (on the arterial side of the capillary) into the interstitial tissue is:
- hydrostatic pressure of the blood
 - hydrostatic pressure of the lymph
 - colloid pressure of the blood

USE THE FOLLOWING FIGURE FOR THE NEXT 3 QUESTIONS (35, 36, and 37).



35. At what point does the aortic valve open? *B*
36. At what point does the aortic valve close? *C*
37. At what point would a normal "P" wave occur on an EKG? *A*
38. Fetal blood would bypass the pulmonary circuit by flowing through this structure located in the fetal interatrial wall:
- the tricuspid atrioventricular valve
 - the ductus arteriosus
 - the foramen ovale
 - the pulmonary semilunar valve
 - the aortic semilunar valve

39. The first heart sound, 'lub', is a valuable aid in diagnosing for mammals:
- semilunar valve dysfunctions (ventricular to pulmonary artery or to aorta)
 - b. atrioventricular valve dysfunctions
 - ileocecal valve dysfunctions
 - pulmonary trunk wall dysfunctions
 - ascending aortic wall dysfunctions
40. In an isotonic contraction of a skeletal muscle:
- A. the muscle tension remains the same, though the muscle length may change.
 - B. the muscle length increases.
 - C. the muscle tension continuously increases, the muscle length increases, and the muscle tension remains the same, though the muscle length may change.
 - D. the muscle tension continuously increases and the muscle length increases.
 - E. the muscle tension continuously increases.
41. Single unit smooth muscle fibers:
- A. form functional discrete units of fibers without gap junction and require multiple motor neurons within each unit.
 - B. each smooth muscle unit has a neuromuscular junction for excitation and inhibition in mammalian preparations.
 - C. each have a neuromuscular junction and have gap-junctions that communicate from the neuron to the muscle fibers.
 - D. form functional group of fibers and have gap-junctions that allow synchronized activity of interconnected fibers.
 - E. none of the answers are correct
42. Which of the following characteristics do skeletal muscle and smooth muscle have in common?
- A. Calcium is bound by the protein calmodulin prior to formation of cross-bridges.
 - B. Tropomyosin is removed from the myosin-binding site on actin, permitting formation of cross-bridges
 - C. Sliding of thick and thin filaments relative to one another depends on a rise in cytosolic calcium.
 - D. Sliding of thick and thin filaments relative to one another results in shortening of the sarcomeres.
 - E. All of these
43. Oxytocin has an action on which tissue ?
- A. anterior pituitary
 - B. mammary glands
 - C. adrenal cortex
 - D. liver
 - E. kidney
44. Which of the following hormone is not release from the anterior pituitary?
- A. Prolactin
 - B. Growth hormone
 - C. Adrenocorticotrophic hormone
 - D. LH
 - E. Antidiuretic hormone
45. Cortisol will increase in the blood primarily due to which hormone ?
- A. Prolactin
 - B. Growth hormone
 - C. ACTH
 - D. LH
 - E. Antidiuretic hormone

46. Which label (A or B or C) would best fit the column for slow oxidative twitch skeletal muscles of mammals? (FILL OUT SCANTRON with answer of letter)

Table 10-1 Properties of twitch (phasic) fibers in mammalian skeletal muscles

Property	A	B	C
Fiber diameter	↓	↔	↑
Force per cross-sectional area	↓	↔	↑
Rate of contraction (V_{max})	↓	↑	↑
Myosin ATPase activity	↓	↑	↑
Resistance to fatigue	↑	↔	↓
Number of mitochondria	↑	↑	↓
Capacity for oxidative phosphorylation	↑	↑	↓
Enzymes for anaerobic glycolysis	↓	↔	↑

Source: Adapted from Sherwood, 2001. Key = ↓ Low ↔ Intermediate ↑ High

47. Specialized cardiac muscle cells that electrical potentials from the septum of ventricles to the ventricular muscle are:

- A. pacemaker cells
- B. bundle of His
- C. tricuspid fibers
- ⓂD. pukinje fibers
- E. sinoatrial cells

48. A decrease in plasma ionized calcium together with an increase in PTH is most likely to be found in a patient with:

- A. hypoparathyroidism
- B. primary hyperparathyroidism
- ⓂC. vitamin D deficiency
- D. vitamin D excess
- E. calcitonin deficiency

Short fill in blank or answers

49. (2 points) Compare and contrast the sympathetic and parasympathetic divisions of the autonomic nervous system by answering the following points. Think how they differ.

Answer the question: Where would be a location of the cell body for the preganglionic neuron in each

sympathetic is located ? _____

parasympathetic is located ? _____

50. **(2 points)** What is (are) the **receptor subtypes** on the postganglionic target cell for each....
The target cell of the postganglionic cell for the sympathetic has what receptor **subtype** ? _____
The target cell of the postganglionic cell for the parasympathetic has what receptor **subtype** ? _____
51. **(2 points)** Explain with diagrams the mechanism of how (**include cellular level mechanisms**) the sympathetic system could alter glucose levels in the blood via actions on the liver ? **Be specific !!!**
52. **(2 points)** How is the spleen important for fighting an infection in humans ?
53. **(2 points)** Say you had a deep cut in your arm and a major artery was damaged. You were bleeding badly. What kind of compensatory mechanisms occur in the short term (seconds) and in the longer term (minutes) to try to maintain blood flow to your brain? **Be specific !!!**