

Final

UNIVERSITY OF TEXAS AT ARLINGTON

DEPARTMENT OF BIOLOGY

HUMAN PHYSIOLOGY
(Biol 3345)

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FINAL EXAMINATION

MAY 08, 2007

First Name

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Last Name:

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There are 108 items in this examination booklet. Be careful not to overlook any pages in the examination booklet. You have 150 minutes to complete these questions.

During the course of the examination students will remain in their assigned seats. If assistance is needed, the student should raise his/her hand and I will attend the individual needs of that student.

Upon completion of the exam, each student is to remain seated, raise her/his hand, and the exam materials will be collected. At no time is the student to leave his/her seat and carry the exam materials to other areas of the room.

After collection of exam materials, the student is to immediately, quietly, and promptly leave the Examination Room.

NO EXTRA TIME WILL BE ALLOWED AT THE END OF THE EXAMINING PERIOD FOR ANSWERS TO BE TRANSFERRED TO THE ANSWER SHEET.

Have a Fun Summer !!

☆ 3rd test

DIRECTIONS: Each of the numbered items or incomplete statements in this section is followed by answers or completions of the statement. Select the ONE lettered answer or completion that is BEST in each case. Mark your answer sheet and write your selection in the left margin beside the question. Each multiple choice question is worth 2 points.

- ☆ 1. Alveolar ventilation refers to:
 - A. the movement of air into and out of the lungs ✓
 - B. the movement of air into and out of the alveoli
 - C. the movement of dissolved gases from the alveoli to the blood
 - D. the movement of dissolved gases from the blood to the alveoli
 - E. the utilization of oxygen by alveolar cells to support metabolism

- ☆ 2. The lamina propria and mucous epithelium are components of the:
 - A. serosa
 - B. adventitia
 - C. muscularis mucosa
 - D. mucosa
 - E. submucosa

- 7. A typical value for intrapleural pressure is _____ mmHg.
 - A. +6
 - B. +3
 - C. 0
 - D. -3
 - E. More information is needed

- 4. According to the law of LaPlace, when comparing two alveoli lined with fluid, pressure in the one with the _____ diameter will be greater.
 - A. larger
 - B. smaller
 - C. odd
 - D. even
 - E. More information is needed

- 5. Chief cells secrete:
 - A. pepsinogen
 - B. gastrin
 - C. mucus
 - D. hydrochloric acid
 - E. intrinsic factor

- 6. Active expiration is produced by contraction of:
 - A. abdominal muscles ✓
 - B. diaphragm
 - C. internal intercostals
 - D. external intercostals
 - E. A and C ✓

- ☆ 7. The airway between the larynx and the primary bronchi is the:
 - A. pharynx
 - B. bronchiole
 - C. trachea
 - D. alveolar duct
 - E. laryngeal duct

- ☆ 8. The lungs are enclosed in _____ membranes.
 - A. pericardial
 - B. pulmonary
 - C. pleural
 - D. thoracic
 - E. costal

- ☆ 9. Progressive waves of muscular contractions that propel the contents of the digestive tract from one point to another are called:
 - A. segmentation
 - B. pendular movements
 - C. peristalsis
 - D. churning movements
 - E. mastication

- 10. The partial pressure of carbon dioxide in arterial blood is approximately:
 - A. 40 mm
 - B. 45 mm
 - C. 50 mm
 - D. 70 mm
 - E. 100 mm

- ☆ 11. The right lung is to _____ as the left lung is to _____.
 - A. three lobes; two lobes
 - B. two lobes; two lobes
 - C. two lobes; three lobes
 - D. three lobes; three lobes
 - E. none of the above

12. Each 100 ml of blood leaving the alveolar capillaries carries away roughly _____ ml of oxygen.
 A. 10 B. 20 C. 30
 D. 50 E. 75
13. Carbohydrate digestion begins in the:
 A. mouth B. esophagus C. stomach
 D. duodenum E. ileum
14. All of the following provide chemoreceptor input to the respiratory centers of the medulla oblongata, **EXCEPT** the:
 A. olfactory epithelium B. medullary chemoreceptors C. aortic body
 D. carotid body E. all of the above
15. A UTA student has a respiratory frequency of 12 breaths/min, her alveolar ventilation is 3,000 ml/min, and her anatomical dead space is 150 ml. Her tidal volume is?
 A. 1500 ml B. 400 ml C. 250 ml
 D. 20 ml E. None of the above.
16. If ambient pressure is considered to be 760 mmHg, what will be the magnitude of intra-alveolar pressure at the end of a normal, quiet expiration when $V_T = 500$ ml, $V_D = 150$ ml, body temp = 37°C and FRC = 2400 ml, and inspired $O_2 = 20.9\%$.
 A. 765 mmHg B. 762 mmHg C. 760 mmHg
 D. 758 mmHg E. 150 mmHg

17. Sandwiched between the layer of circular and longitudinal muscle in the muscularis externa is the:
 A. mucosa B. submucosa C. muscularis mucosa
 D. myenteric plexus E. submucosa plexus
18. A 25 year old Human Physiology student has a total lung capacity of 6500 ml, residual volume of 1000 ml, tidal volume of 500 ml and inspiratory capacity of 3000 ml. Her functional residual capacity (FRC) is:
 A. 2,500 ml B. 3,000 ml C. 5,500 ml
 D. 4,000 ml E. 3,500 ml

19. A subject has a tidal volume of 600 ml, an anatomical dead space of 200 ml and a respiratory rate of 15 breaths per minute. His alveolar ventilation (V_A) is (in ml/minute):
 A. 800 B. 3,000 C. 9,000
 D. 12,000 E. 6,000

20. In the Peruvian Andes where the atmospheric pressure is half the normal sea level value, the PO_2 of tracheal inspired gas is:
 A. 60 mm Hg B. 70 mm Hg C. 80 mm Hg
 D. 90 mm Hg E. 100 mm Hg

21. The root of a tooth is covered by:
 A. enamel B. cementum C. dentin
 D. pulp E. the root canal

22. Type I alveolar cells
 A. allow rapid diffusion of gases through their thin membranes
 B. secrete a chemical known as surfactant
 C. are phagocytic
 D. all of the above
 E. none of the above

A 2nd test

12 1.2 =

3000
+ 1800
4800
12

3000
+ 1800
4800

3000
1800
4800

100 x 12 = 1200
1200 x 4 = 4800

12 x 250 = 3000
3000 - 12(150) = 3000 - 1800 = 1200
1200 / 4 = 300

12 x (250 - 150) = 12 x 100 = 1200

30

9
A

A

A

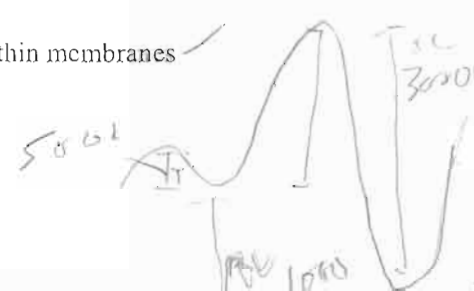
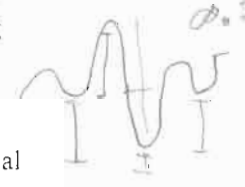
380

A x 0.21

380

79.80

380
2 | 760
6
16



450
x 15
6750

2000
400
6000

381
x 0.21

360
60
79.80

A 3rd test

23. The parietal cells secrete:

- ~~A.~~ pepsinogen
- ~~D.~~ hydrochloric acid
- ~~B.~~ gastrin
- E. enterokinase

C. mucus

A

24. Surfactant:

- ~~A.~~ protects the surface of the lungs
- ~~B.~~ phagocytizes small particulate matter
- ~~C.~~ replaces mucus in the alveoli
- D. helps prevent the alveoli from collapsing
- ~~E.~~ is not found in healthy lung tissue

A

25. When the diaphragm and external intercostal muscles contract:

- A. the volume of the thorax increases
- ~~B.~~ the volume of the thorax decreases
- ~~C.~~ the volume of the lungs decreases
- ~~E.~~ the lungs collapse
- ~~F.~~ expiration occurs

A

26. Dalton's law states that:

- ~~A.~~ gas volume and temperature are directly proportional
- ~~B.~~ gas volume and pressure are inversely proportional
- ~~C.~~ the volume of gas that will dissolve in a solvent is proportional to the solubility of the gas and the gas pressure
- D. in a mixture of gases like air, the total pressure is the sum of the individual partial pressures of the gasses in the mixture
- ~~E.~~ None of the above is true.

A

27. Boyle's law states that gas volume is:

- ~~A.~~ directly proportional to pressure
- ~~B.~~ directly proportional to temperature
- C. inversely proportional to pressure
- ~~D.~~ inversely proportional to temperature
- ~~E.~~ None of the above is correct.

A

28. When the diaphragm and external intercostal muscles contract:

- ~~A.~~ expiration occurs
- ~~B.~~ intrapulmonary pressure increases
- ~~C.~~ intrapleural pressure decreases
- ~~D.~~ the volume of the lungs decreases
- ~~E.~~ All of the above are correct.

A

29. Saliva is:

- A. very acidic, with a pH of 3-4
- B. controlled by the autonomic nervous system
- ~~C.~~ Not stimulated by sympathetic innervation
- ~~D.~~ Secreted from endocrine glands
- E. A and B

A

30. Damage to the type II cells of the lungs would contribute to:

- ~~A.~~ a thickening of the respiratory membrane
- ~~B.~~ an increased rate of gas exchange
- ~~C.~~ alveolar rupture
- D. alveolar collapse
- ~~E.~~ decreased surface tension in the water lining the alveoli

31. In quiet breathing:
- ~~A. inspiration and expiration involve muscular contractions~~
 - ~~B. inspiration is passive and expiration involves muscular contractions~~
 - C. inspiration involves muscular contraction and expiration is passive
 - ~~D. inspiration and expiration are both passive processes~~
 - ~~E. None of the above is correct.~~
32. Breathing that involves active inspiratory and expiratory movements is called?
- ~~A. eupnea~~
 - ~~B. hyperpnea~~
 - ~~C. diaphragmatic breathing~~
 - ~~D. costal breathing~~
 - E. shallow breathing
33. Increased parasympathetic stimulation of the intestine would result in:
- A. decreased motility
 - ~~B. decreased secretion~~
 - C. decreased sensitivity of local reflexes
 - D. decreased segmentation
 - ~~E. None of the above is correct.~~
34. If a student inhales as deeply as possible and then blows the air out until he cannot exhale any more, the amount of air that he expelled would be his:
- ~~A. tidal volume~~
 - ~~B. inspiratory reserve volume~~
 - C. expiratory reserve volume
 - ~~D. minimal volume~~
 - ~~E. vital capacity~~
35. Increasing the alveolar ventilation rate will:
- A. increase the partial pressure of oxygen in the alveoli
 - ~~B. decrease the rate of oxygen diffusion from the alveoli to the blood~~
 - ~~C. increase the partial pressure of carbon dioxide in the alveoli~~
 - ~~D. decrease the rate of carbon dioxide diffusion from the blood to the alveoli~~
 - ~~E. have no effect on either the partial pressure or diffusion rate of gases~~
36. The process by which dissolved gases are exchanged between the blood and interstitial fluids is:
- ~~A. pulmonary ventilation~~
 - ~~B. external respiration~~
 - C. diffusion
 - ~~D. cellular respiration~~
 - ~~E. breathing~~
37. An increase in the level of carbon dioxide in the blood will:
- ~~A. decrease the rate of breathing~~
 - B. increase the rate of breathing
 - ~~C. decrease pulmonary ventilation~~
 - ~~D. decrease the alveolar ventilation rate~~
 - ~~E. A, C, and D~~

38. Carbon dioxide is more soluble in water than oxygen. To get the same amount of oxygen to dissolve in plasma as carbon dioxide, you would have to
- A. decrease the temperature of the plasma
 - B. increase the partial pressure of oxygen
 - C. decrease the partial pressure of nitrogen
 - D. increase the rate of plasma flow through the lung
 - E. decrease the alveolar ventilation rate
39. The myenteric plexus is:
- A. a layer of circular smooth muscle
 - B. a layer of longitudinal smooth muscle
 - C. a network of neurons
 - D. the mucus secreting layer of the digestive tract
 - E. primarily composed of connective tissue
40. Which of the following factors would increase the amount of oxygen released by hemoglobin to peripheral tissues?
- A. decreased temperature
 - B. decreased pH
 - C. increased tissue PO_2
 - D. decreased amounts of 2-3-DPG
 - E. All of the above are correct.
41. For maximum efficiency in loading oxygen at the lungs:
- A. the pH should be slightly acidic
 - B. the temperature should be slightly lower than normal body temperature
 - C. PO_2 should be about 70 mmHg
 - D. 2-3-DPG levels in the red blood cells should be high
 - E. All of the above are correct.
42. A student in your lab volunteers to enter a hypoxic breathing chamber for 10 minutes, and his alveolar PO_2 drops to 50 mmHg. What other change would occur?
- A. decreased in arterial pH
 - B. decrease in arterial PCO_2
 - C. decrease in pH of cerebrospinal fluid
 - D. increase in alveolar PCO_2
 - E. hypoventilation
43. At the start of the respiratory cycle, the relationship between the intrapulmonary and atmospheric pressure is that:
- A. they are equal
 - B. intrapulmonary pressure is greater than atmospheric
 - C. atmospheric pressure is more than intrapulmonary
 - D. atmospheric pressure is less than intrapulmonary
 - E. intrapulmonary pressure is less than atmospheric
44. The Bohr effect:
- A. does not take place in the plasma because plasma has no carbonic anhydrase
 - B. depends on the size of the anatomic dead space
 - C. results in a rightward shift of the O_2 dissociation curve when CO_2 is removed from blood
 - D. is partly due to the combination of negatively charged hemoglobin with H^+
 - E. is disadvantageous to O_2 binding by Hb as red cells pass through the lung capillaries

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45. In mouth-to-mouth artificial respiration, the rescuer blows air from his or her own respiratory system into that of the victim, thus:
- A. expansion of the victim's lungs is brought about by blowing air in at higher than atmospheric pressure ✓
 - B. during inflation of the lungs, the intrapleural pressure increases
 - C. intrapulmonary pressure exceeds intrapleural pressure
 - D. All of the above are correct.
 - E. ~~Cannot be determined~~
46. Which of the following statements concerning alveolar pressure is/are correct?
- A. Alveolar pressure is less than atmospheric pressure during a normal negative pressure inspiration. ✓
 - B. Alveolar pressure is greater than atmospheric pressure during a forced expiration. ✓
 - C. Alveolar pressure equals atmospheric pressure at the end of a normal tidal expiration. ✓
 - D. All of the above. ✓
 - E. Only two of the above are correct.
47. The activities of the digestive system are regulated by:
- A. hormones ✓
 - B. parasympathetic and sympathetic neurons ✓
 - C. the contents of the digestive tract ✓
 - D. all of the above ✓
 - E. A and B only
48. The function of the nasal conchae is to:
- A. divide the nasal cavity into a right and left side
 - B. provide an opening into the pharynx ✓
 - C. provide a surface for the sense of smell
 - D. create turbulence in the air so as to trap small particulates in mucus ✓
 - E. provide an opening to the outside of the body
49. Breathing faster and deeper eliminates more carbon dioxide from the body than normal breathing because:
- A. more carbon dioxide will diffuse out of the blood ✓
 - B. more carbon dioxide will diffuse into the blood
 - C. less carbon dioxide will diffuse out of the blood
 - D. less carbon dioxide will diffuse into the blood
 - E. the rate of carbon dioxide diffusion will remain the same

Match each with its function (Questions 50 and 51):

- A. If the items vary directly ✓
 - B. If the items vary inversely ✓
 - C. If changes in the first item are not ordinarily accompanied by changes in the second
 - D. Both A and B
 - E. Neither A nor B
50. Area of a membrane AND the total amount of a gas diffusing through that membrane.
51. Thickness of a membrane AND diffusion of a gas through that membrane.

3

COMPREHENSIVE MULTIPLE CHOICE QUESTIONS

DIRECTIONS: Each of the numbered item or incomplete statement in this section is followed by answers or completions of the statement. Select the ONE lettered answer or completion that is BEST in each case. Mark your answer sheet and write your selection in the left margin beside the question. Each multiple choice question is worth 2 points.

52. A 5 M solution of 100 ml of glucose contains how many grams of glucose, M.W. 180 daltons?
 A. 180
 B. 360
 C. 1.0
 D. 6.023×10^{23}
 E. 90
Handwritten: 4/18, 5, 90, 100/5ml (180)
53. Motor innervation of the voluntary swallowing muscles and intrinsic laryngeal muscles is by way of the _____ nerve.
 A. abducens
 B. vestibulocochlea
 C. spinal accessory
 D. hypoglossal
 E. vagus
54. The third and fourth ventricles are linked by the:
 A. central canal
 B. lateral ventricles
 C. mesencephalic aqueduct
 D. interventricular foramina
 E. medulla oblongata
55. The intensity of a stimulus can be determined by:
 A. population coding
 B. labeled line coding
 C. frequency coding
 D. A and C
 E. All of the above.
56. Sensations of gravity and linear acceleration are registered in the:
 A. semicircular canals
 B. cochlea
 C. saccule and utricle
 D. ossicles
 E. organ of Corti
57. General properties of sensory reception include all of the following **EXCEPT**:
 A. stimulus artifact
 B. receptor
 C. transducer
 D. afferent pathway
 E. integrating center
58. Receptors on postganglionic neurons of the sympathetic nervous systems are?
 A. muscarinic
 B. nicotinic
 C. Both A and B
 D. adrenergic
 E. acetylcholine
59. Transection of the infundibulum would result in a loss of which of the following hormone(s)?
 A. FSH
 B. growth hormone
 C. TSH
 D. ADH
 E. both B and C
60. In neurons, graded potentials routinely occur in the:
 A. dendrites
 B. cell body
 C. axon
 D. A and B
 E. A, B, and C
61. Excess cerebrospinal fluid is drained into the:
 A. jugular veins
 B. dural sinus
 C. superior sagittal sinus
 D. falx cerebri
 E. cranial vein
62. Which body fluid compartment contains higher levels of Na^+ , Cl^- , and HCO_3^- ?
 A. plasma
 B. interstitial fluid
 C. intracellular fluid
 D. A and C
 E. A and B
63. The receptors in the inner ear are the:
 A. utricles
 B. saccules
 C. hair cells
 D. supporting cells
 E. ampullae

64. Preganglionic fibers of parasympathetic neurons can be found in all of the following cranial nerves, EXCEPT C.N.:
- A. III
 - B. VII
 - C. IX
 - D. X
 - E. XII
65. You conduct an experiment on twenty, 18-year-old males (subjects) to see how various intensities of exercise influence heart rate. Which of the following is/are considered an independent variable?
- A. age of subjects
 - B. sex of subjects
 - C. intensity of exercise
 - D. heart rate
 - E. more than one of these
66. Postganglionic fibers of autonomic neurons are usually:
- A. myelinated
 - B. larger than preganglionic fibers
 - C. located in the brain
 - D. located in the spinal cord
 - E. unmyelinated
67. The flattening of the action potentials of myocardial contractile cells, called the plateau phase, is due to a combination of ____ K⁺ permeability and ____ Ca²⁺ permeability.
- A. increasing, increasing
 - B. decreasing, decreasing
 - C. increasing, decreasing
 - D. decreasing, increasing
 - E. cannot be determined
68. The afferent and efferent axons together form the:
- A. central nervous system
 - B. autonomic division system
 - C. peripheral nervous system
 - D. somatic motor division of the nervous system
 - E. visceral nervous system
69. One atom of an element usually has:
- A. more protons than electrons
 - B. equal numbers of protons and electrons
 - C. more neutrons than electrons
 - D. the same number of protons, electrons, and neutrons
 - E. it depends on the element
70. Which of the following does NOT influence membrane permeability?
- A. the size of the diffusing molecule
 - B. the thickness of the lipid bilayer
 - C. the lipid solubility of the diffusing molecule
 - D. the composition of the lipid bilayer
71. The law of mass balance states:
- A. total amount of substance X in the body = intake + production - output
 - B. if the amount of a substance in the body is to remain equal, any loss must be offset by an equal gain
 - C. total amount of substance X in the body = intake - production - output
 - D. A and B
 - E. B and C
72. Inositol triphosphate:
- A. is a water-insoluble messenger molecule
 - B. binds to the calcium channel of the endoplasmic reticulum
 - C. is involved in the release of calcium into the cytosol
 - D. B and C
 - E. All of the above are correct.

73. The **motor end plate** is:
- A. a folded area of muscle cell membrane with ACh receptors clustered at the top of each fold
 - B. the same as the neuromuscular junction
 - C. the same as the synaptic cleft
 - D. formed by the membrane of enlarged axon terminals, or boutons, that lie on the surface of skeletal muscle cells
 - E. a special fibrous matrix whose collagen fibers hold the axon terminal in proper position
74. **Nicotinic** receptors:
- A. bind ACh and open monovalent cation channels.
 - B. are found on skeletal muscles at the neuromuscular junction.
 - C. are identical throughout the nervous system.
 - D. A and B
 - E. A, B, and C
75. The subdural space:
- A. separates the arachnoid mater from the pia mater
 - B. separates the pia mater from the dura mater
 - C. separates the dura mater from the brain
 - D. contains cerebrospinal fluid
 - E. is between the vertebrae and the dura mater
76. Which statement regarding CSF production and flow is correct?
- A. CSF is produced along the spinal cord
 - B. CSF is produced by meningeal cells
 - C. CSF enters the meningeal layer through the cerebral aqueduct
 - D. CSF flows inferiorly along the dorsal subarachnoid space of the spinal cord
 - E. CSF does not flow through the meningeal layers
77. Interneurons:
- A. are found only in the central nervous system
 - B. carry only sensory impulses
 - C. carry only motor impulses
 - D. only connect motor neurons to other motor neurons
 - E. are found between neurons and their effectors
78. Astrocytes:
- A. induce formation of the blood-brain barrier
 - B. are important in the repair of brain injuries and in neural scar formation
 - C. take up excess K^+ from the brain ECF
 - D. physically support neurons
 - E. All of these answers are correct.
79. The dorsal root ganglia contain:
- A. axons of motor neurons
 - B. axons of sensory neurons
 - C. cell bodies of motor neurons
 - D. cell bodies of sensory neurons
 - E. C and D

80. In which of the following would the rate of impulse conduction be the greatest?
- A. a myelinated fiber 20 microns in diameter
 - B. a nonmyelinated fiber 20 microns in diameter
 - C. a myelinated fiber 2 microns in diameter
 - D. a nonmyelinated fiber 2 microns in diameter
 - E. a nonmyelinated fiber 25 cm long
81. During the cardiac cycle:
- A. the P wave of the ECG occurs between the first and second heart sounds
 - B. the QRS complex of the ECG precedes the increase in ventricular pressure
 - C. the third heart sound occurs during atrial systole
 - D. the second heart sound coincides with the QRS complex of the ECG
 - E. the greatest increase in ventricular pressure occurs during the ejection phase
82. In cardiac muscle:
- A. calcium ions are not released from the sarcoplasmic reticulum
 - B. calcium ions do not bind to troponin molecules
 - C. calcium ions play no role in the process of contraction
 - D. some of the calcium ion required for contraction comes from outside of the cell
 - E. calcium ion plays an important role in repolarizing the membrane after the depolarization phase
83. The plateau phase of the cardiac muscle action potential is due to:
- A. the movement of fewer sodium ions across the cell membrane
 - B. the calcium channels remaining open longer than the sodium channels
 - C. the increased membrane permeability to potassium
 - D. a decrease in the amount of calcium diffusing across the membrane
 - E. an increased membrane permeability to sodium ions
84. The lacrimal apparatus:
- A. is a system of glands and ducts
 - B. keeps the cornea moist with continuous tear flow
 - C. is innervated by sympathetic neurons from cranial nerve VII
 - D. A and B
 - E. All of the above are correct.
85. The purpose of transverse tubules is to:
- A. ensure a supply of Ca^{2+} ions through the muscle fiber
 - B. rapidly conduct the action potentials to the interior of the muscle fiber
 - C. ensure a supply of glycogen throughout the muscle sarcoplasm
 - D. conduct the ATP molecules out of the mitochondria throughout the sarcoplasm
 - E. All of these statements are true.
86. Fast pain, usually described as sharp and localized, is carried by:
- A. large, unmyelinated C fibers
 - B. small, myelinated A-delta fibers
 - C. small, unmyelinated C fibers
 - D. large myelinated A-beta fibers
 - E. None of the above.

★ 2nd test

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87. What structures monitor vertical movements?

- A. cristae and the semicircular canals
- B. maculae of the saccule
- C. maculae of the utricle
- D. B and C
- E. All of the above

88. If the EDV is 140 mL, which other values are most likely to occur in a healthy, normal person?

- A. The ESV could be 70 mL and the SV could be 70 mL.
- B. The ESV could be 190 mL and the SV could be 50 mL.
- C. The ESV could be 230 mL and the SV could be 90 mL.
- D. A and B
- E. A and C

*230
140

90*

SV = EDV - ESV
140 - 70 = 70
230 - 140 = 90

89. Ca^{2+} is important in the contraction of smooth muscle. Which of the following is NOT true about smooth muscle contraction?

- A. Ca^{2+} enters the cytosol from the sarcoplasmic reticulum.
- B. Ca^{2+} binds to calmodulin.
- C. Contraction is immediately triggered by calmodulin binding.
- D. MLCK (myosin light chain kinase) forms a complex to activate myosin.
- E. When MLCK activates myosin, ATPase activity is high and crossbridge formation is active.

90. An important difference between single-unit and multi-unit smooth muscle is _____.

- A. numerous gap junctions in single-unit smooth muscle, which allow many cells to work together as a sheet
- B. longer actin and myosin filaments in multi-unit smooth muscle, which allow coordination of contraction
- C. the ability of single-unit fibers to change into multi-unit fibers when advantageous
- D. closely controlled individual fibers in single-unit smooth muscle to allow fine control and graded contractions by selective activation
- E. All of these

91. According to the length-tension relationship:

- A. longer muscles can generate more tension than shorter muscles
- B. the greater the zone of overlap in the sarcomere the greater the tension the muscle can develop
- C. the greatest tension is achieved in sarcomeres where the actin and myosin initially do not overlap
- D. there is an optimum range of actin and myosin overlap that will produce the greatest amount of tension
- E. both B and D

92. The depolarization phase of the conducting system muscle action potential is the result of:

- A. increased membrane permeability to sodium ions
- B. increased membrane permeability to potassium ions
- C. increased membrane permeability to calcium ions
- D. decreased membrane permeability to sodium ions
- E. increased membrane permeability to chloride ions

★

93. Contractions of the papillary muscles:

- A. close the atrioventricular valves
- B. close the semilunar valves
- C. eject blood from the ventricles
- D. prevent the atrioventricular valves from projecting into the atria
- E. eject blood from the atria into the ventricles

94. A placebo is:
- ~~A.~~ any drug being tested in a clinical trial
 - ~~B.~~ any drug in a class of drugs commonly used as pain relievers
 - C. a drug or treatment that is expected to have no pharmacological effect
 - ~~D.~~ a nutritive and respiratory organ in fetal development
 - ~~E.~~ a hole in a cavity through which an organ protrudes
95. Active transport is characterized by:
- ~~A.~~ all of the characteristics of carrier-mediated transport
 - B. net uphill movement of the transported substance
 - ~~C.~~ coupling of the transport process to a metabolic process
 - ~~D.~~ coupling of two transported substances in either the same or opposite directions
 - ~~E.~~ Only A and C are correct
96. Some important generalizations about homeostatic control systems include:
- ~~A.~~ it is possible for everything to be maintained relatively constant
 - ~~B.~~ complete constancy of any given feature is maintained
 - ~~C.~~ stability is achieved by controlling the output only
 - ~~D.~~ all of the above
 - E. a change in the variable being regulated brings about responses which tend to push the variable in a direction opposite the original change
97. Osmotic pressure inside a cell:
- ~~A.~~ is identical to the hydrostatic pressure built up inside the cell
 - ~~B.~~ is proportional to the intracellular concentration of all solute particles
 - ~~C.~~ is inversely proportional to the absolute temperature
 - D. is one of the "forces" governing the movement of water across the cell membrane
 - ~~E.~~ Only B and D are correct
98. The posterior pituitary:
- ~~A.~~ is composed of nervous tissue
 - ~~B.~~ stores anterior pituitary hormones, which are released into the blood upon hypothalamic stimulation
 - ~~C.~~ synthesizes and secretes vasopressin and oxytocin
 - D. Both A and C above are correct.
 - ~~E.~~ All of these are correct answers.
99. Select the statement that is most correct.
- ~~A.~~ Ganglia are collections of neuron cell bodies in the CNS that are associated with efferent fibers.
 - ~~B.~~ Efferent ganglia are not associated with the autonomic system.
 - ~~C.~~ The dorsal root ganglion is a motor only structure.
 - ~~D.~~ The cell bodies of afferent ganglia are located in the spinal cord.
 - E. Ganglia exist outside the spinal cord.
100. T/F (A/B) Cranial nerve XI is the abducens nerve.

T

Short Answer Questions

Please answer these questions briefly. Label diagrams correctly, with lines pointing to the proper structures. Partial credit will be given where appropriate. Write legibly!! You can use the back of the last page to continue any question. Number them, please!!

101. What are the functions of the pleural fluid? (5 points)

1-4 The pleural fluid between the two pleural membranes that connect the lung to the thorax cage. In addition, the pleural fluid allows the lung to move by sliding motion.

102. The rate of blood flow through the lungs is lower (higher/the same/lower) than the rate in other tissues. Why? Justify your answer! (5 points)

It is lower because of the surface area of the lung that contain many capillaries. So that the blood can slowly move through capillaries to pick up enough O_2 .

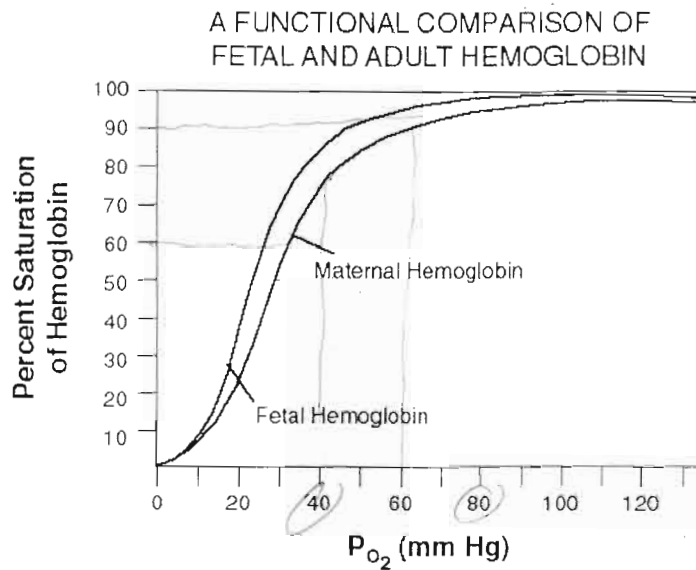
103. Construct a table showing typical lung volumes for males and females. (4 points)

1 Tidal volume = 500 ml for male | < 500 ml for female
or

104. What are the 3 ways CO_2 is transported in blood? Approximately what percentage is transported by each way? (3 points)

2 1) dissolved in plasma (> 2%)
2) by converting to HCO_3^- (70%)
3) by $HbCO_2$ (< 24%)

Refer to the graph below.



105. A. At a PO₂ of 80 mmHg, which type of hemoglobin binds more oxygen? (1 point)

Fetal Hemoglobin

B. At a PO₂ of 40 mmHg, which type of hemoglobin has released more oxygen to the cell? (1 point)

Maternal Hemoglobin

C. Explain the significance of the differences in hemoglobin affinity. (3 points)

From PO₂ of 60 and above, the affinity of the two types of hemoglobin slightly different. From 40 to 60 mmHg O₂, Fetal Hemoglobin bind to more O₂ than maternal Hb. Finally, from 0 mmHg to 40 mmHg, maternal Hb release more O₂.

D. If a worm lived in low oxygen mud flats where the PO₂ is 60 mmHg, which type of hemoglobin would be better for it to have? Explain. (3 points)

The fetal Hemoglobin, because it bind to more O₂.

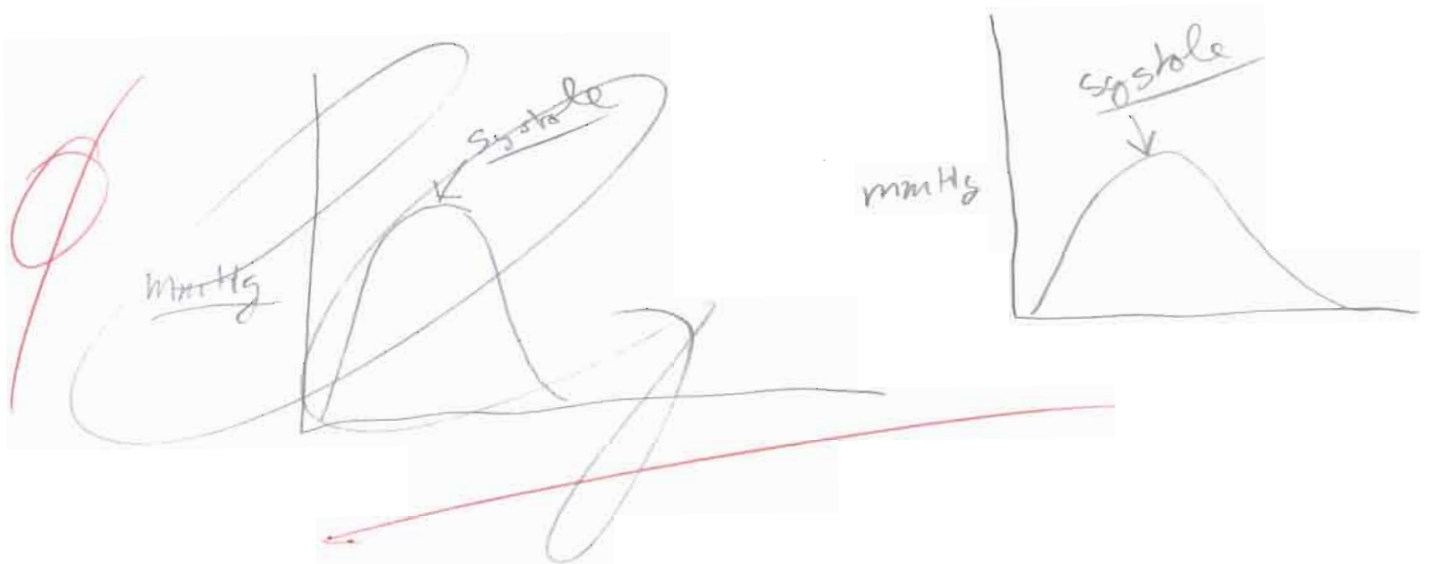
4

COMPREHENSIVE SHORT ANSWER QUESTIONS

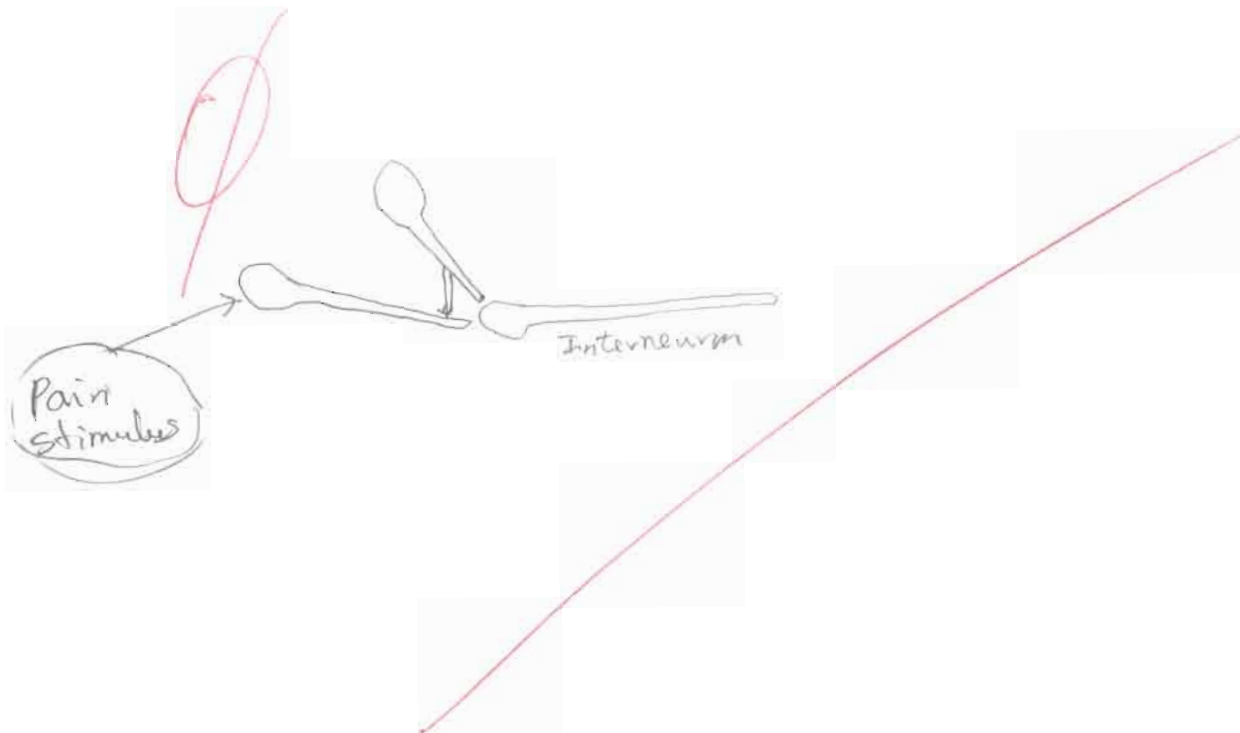
Please answer these questions briefly. Label diagrams correctly, with lines pointing to the proper structures. Partial credit will be given where appropriate. Write legibly!! You can use the back of the last page to continue any question. Number them, please!!

Answer questions 106 AND 107, and any one from question 108.

106. Draw and completely label the pressure changes that occur in the left ventricle during a cardiac cycle. (6 points)



107. Draw and completely label the neuronal arrangement of the nerve fibers involved in the gate-control theory of pain. (6 points)



Answer any one (1) question from the list below. Circle the question that you are answering.

108. List eight (8) endocrine structures AND all the hormones they secrete, respectively. Do not include the hypothalamus, the pituitary and adrenal medulla. (8 points)

OR

Describe the four classes of membrane receptor molecules. (6 points)

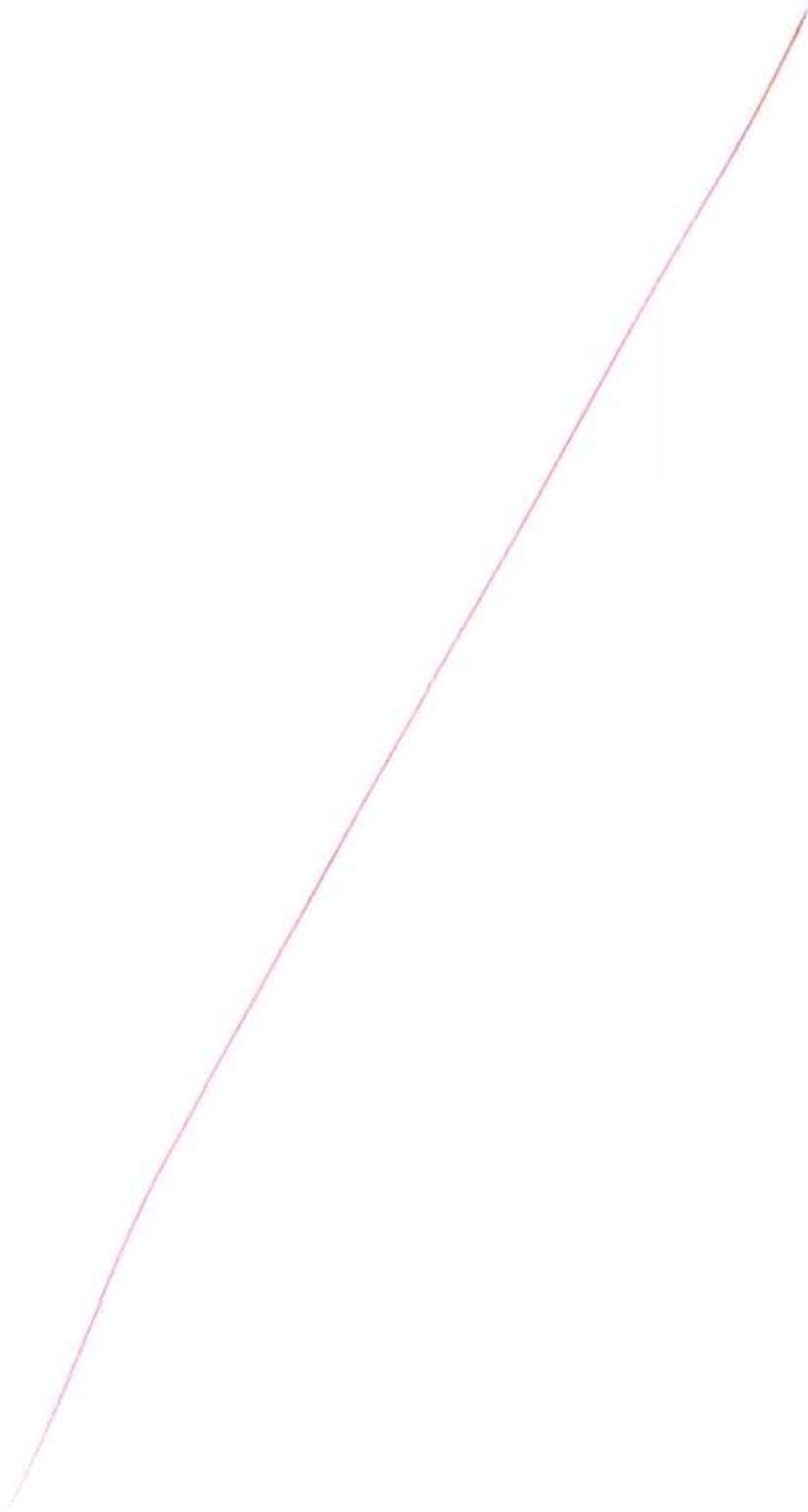
OR

Write out the Nernst equation and explain its significance. What is the equilibrium potential for an ion? (5 points)

1)
$$E_{ion} = \frac{61 \Delta [ion]_{out}}{Z [ion]_{in}}$$

2) E_{ion} potential of an ion = the electrical force and the concentration gradient are balance.

2



PART 1

SUBJECTIVE SCORE INSTRUCTOR USE ONLY

<100	<90	<80	<70	<60
<50	<40	<30	<20	<10
<9	<8	<7	<6	<5
<4	<3	<2	<1	<0

	(T)	(F)	KEY		
	<%	<2	<3	<5	
1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
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45	A	B	C	D	E
46	A	B	C	D	E
47	A	B	C	D	E
48	A	B	C	D	E
49	A	B	C	D	E
50	A	B	C	D	E

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FEED THIS DIRECTION

A

06/07/08 M12 1506 999 12 11 10 9 8 7 6 5

IMPORTANT

TO USE SUBJECTIVE SCORE FEATURE:

- Mark total possible subjective points
- Only one mark per line on key
- 153 points maximum

EXAMPLE OF STUDENT SCORE:

100	90	80	70	60	50	40	30	20	10	0
100	90	80	70	60	50	40	30	20	10	0

• MAKE DARK MARKS

• ERASE COMPLETELY TO CHANGE

EXAMPLE: (A) (B) (C) (D) (E)

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1-5

Quang He
04/26/07
Human Phys.
100462979

- exchange CO_2 and O_2
- ventilation
- ~~import O_2 and~~ transport O_2 and CO_2



