

Friday, January 31st, 2025

Following directions on the mark-sense form, write your **name, and student number** in the blanks and fill in the bubbles. In addition, write your **name** on this exam.

When finished with the test, turn in both the mark-sense form and the exam at the front of the room.

Correct answers are in red bold face.
PLACE ALL ANSWERS ON THE MARK-SENSE FORM

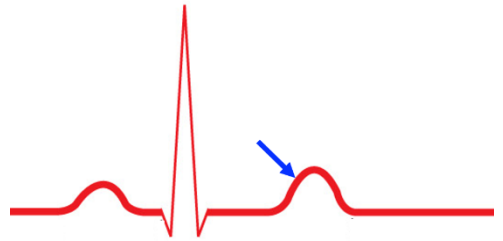
MULTIPLE CHOICE: Always choose the BEST, most complete answer. (2 points each)

1. Which of the following has the lowest pressure?
 - a. a brachial artery during systole
 - b. a brachial artery during diastole
 - c. a coronary artery during systole
 - d. a coronary artery during diastole
 - e. **a pulmonary artery during systole**

2. The second heart sound (S2) is caused by
 - a. the contraction of the papillary muscles
 - b. the opening of the AV valves
 - c. the closing of the AV valves
 - d. turbulent flow in the ventricles
 - e. **the closing of the semilunar valves**

3. Fill in the blank. _____ is a diagnostic technique that uses ultrasound to visualize the heart and valves.
 - a. **echocardiography**
 - b. sphygmomanometry
 - c. electrocardiography
 - d. magnetic resonance imaging

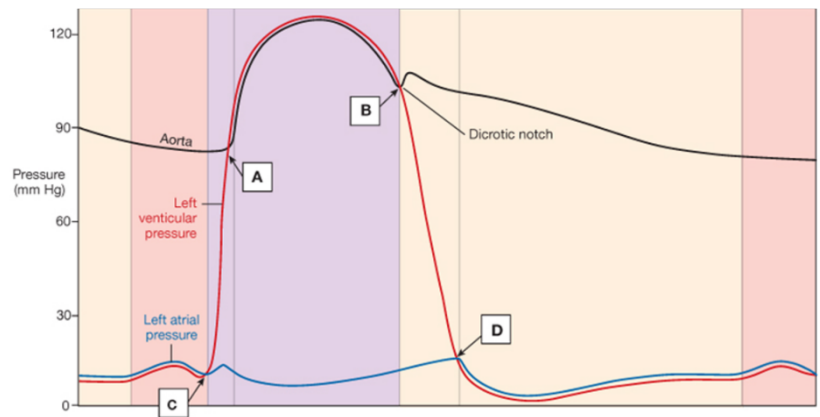
4. Which of the following is a feature of cardiac muscle and NOT skeletal muscle?
- a. thick and thin filaments arranged in sarcomeres
 - b. action potential that lasts longer than 200 milliseconds**
 - c. Ca^{++} regulates contraction
 - d. sarcoplasmic reticulum
 - e. voltage-gated Na^+ channels
5. The voltage-gated ion channel that opens in response to hyperpolarization is most important for
- a. the rising phase of the action potential in a contractile cell
 - b. the falling phase of the action potential in a contractile cell
 - c. the resting membrane potential in a contractile cell
 - d. the pacemaker potential in a pacemaker cell**
 - e. the rising phase of the action potential in a pacemaker cell
6. Specialized pacemaker cells can be found in all of the following places EXCEPT the
- a. AV node.
 - b. cardiac skeleton.**
 - c. bundle of His.
 - d. Purkinje fibers.
 - e. SA node.
7. Refer to the figure. What is occurring to cause the waveform indicated by the blue arrow?
- a. ventricles are repolarizing**
 - b. ventricles are contracting
 - c. action potential traveling through the ventricles
 - d. action potential traveling through the atria
 - e. atria are contracting



8. Which of the following is TRUE about atrial fibrillation?
- a. the ventricles don't pump blood
 - b. increases end-diastolic volume
 - c. is often treated with drugs that prevent blood clots**
 - d. causes an electrocardiogram in which there are no R waves
 - e. is rapidly fatal if not immediately treated with a defibrillator

9. Refer to the figure at right.
Which letter (A, B, C, D) indicates the time when the aortic valve closes after being open?

- a. A
- b. B**
- c. C
- d. D



10. Which of the following is true about isovolumetric relaxation?

- a. occurs at the beginning of systole
- b. occurs immediately after the first heart sound
- c. all the valves are closed**
- d. all the valves are open
- e. the pressure in the ventricles rises rapidly

11. How does acetylcholine (ACh) affect the heart?

- a. increases contractility
- b. decreases the slope of the pacemaker potential**
- c. increases heart rate
- d. causes depolarization in pacemaker cells
- e. causes a longer opening time for I_f ("funny") channels

12. Fill in the blank. According to the Frank-Starling Law of the Heart, increasing the _____ increases the stroke volume.

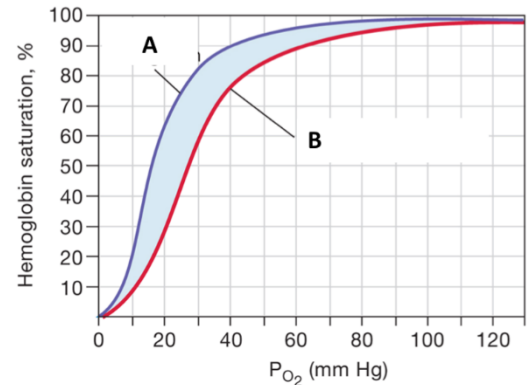
- a. afterload
- b. heart rate
- c. end-diastolic volume**
- d. end-systolic volume
- e. pacemaker potential

13. Increasing which of the following factors will cause an increased stroke volume? (choose best, most complete answer)
- a. contractility of the heart
 - b. central venous pressure
 - c. total peripheral resistance
 - d. BOTH contractility and central venous pressure**
 - e. BOTH central venous pressure and total peripheral resistance
14. Which of the following is most closely associated with contractility?
- a. amount of Ca^{++} available to promote contraction**
 - b. parasympathetic input to the heart muscle
 - c. input to the SA node that increases the heart rate
 - d. constriction of the arterioles
 - e. activation of the renin-angiotensin-aldosterone system
15. Which of the following drugs affects blood pressure by directly decreasing total peripheral resistance?
- a. glucocorticoid
 - b. leukotriene modifier
 - c. muscarinic antagonist
 - d. adrenergic agonist
 - e. Ca^{++} channel blocker**
16. Which of the following often increases in heart failure?
- a. cardiac output
 - b. parasympathetic input to the heart
 - c. stroke volume
 - d. ECF volume**
 - e. oxygen-carrying capacity of the blood
17. Which of the following best describes the protein that is defective in cystic fibrosis?
- a. digestive enzyme released by macrophages
 - b. glycoprotein found in airway mucus
 - c. elastic connective tissue protein
 - d. Cl^- channel important for fluid secretion**
 - e. motor protein found in airway cilia

18. When the rescue medication albuterol causes bronchodilation, it is acting as an agonist for receptors that are normally stimulated by
- a. the hormone cortisol
 - b. the hormone epinephrine**
 - c. leukotrienes
 - d. inflammatory paracrine
 - e. acetylcholine
19. All of the following are present in alveolar tissue EXCEPT
- a. columnar epithelial cell**
 - b. endothelial cell
 - c. macrophage
 - d. cell that secretes surfactant
 - e. elastic connective tissue
20. When the diaphragm contracts
- a. air enters the intrapleural cavity
 - b. the volume of the thoracic cavity decreases
 - c. alveoli shrink in volume due to elastic recoil
 - d. it moves upward
 - e. the pressure inside the lungs falls below atmospheric pressure**
21. Dead space is a term used to designate
- a. the air left in the alveoli at the end of a breath.
 - b. the volume of air in the airways that does not participate in gas exchange.**
 - c. the large air spaces that result from connective tissue breakdown in emphysema.
 - d. the total volume of air that can be moved out of the respiratory system in one breath.
 - e. the volume of air leaving the lungs in the first second of exhalation.
22. Which of the following is too low in a premature infant with infant respiratory distress syndrome?
- a. fluid secretion by airway epithelial cells
 - b. elastic recoil of the lungs
 - c. compliance of the lungs**
 - d. mucociliary clearance
 - e. airway resistance

23. Refer to the figure at right. Which curve represents the hemoglobin saturation curve for fetal hemoglobin?

- a. **A**
- b. B



24. Which of the following does NOT bind to hemoglobin?

- a. H^+
- b. **HCO_3^-**
- c. O_2
- d. CO_2

25. Which of the following best describes what occurs in pulmonary fibrosis?

- a. **lung compliance is too low so forced vital capacity (FVC) is decreased**
- b. small airways collapse and obstruct outflow of air during exhalation
- c. hyperresponsive smooth muscle constricts airways and obstructs outflow of air during exhalation
- d. lung compliance is too high so forced expiratory volume in one second (FEV1) is decreased
- e. fibrosis increases ECF volume so that fluid accumulates in alveoli

26. The central chemoreceptors directly respond to

- a. PO_2
- b. decreased pH in the plasma
- c. **increased pH in the CSF**
- d. **increased H^+ in the CSF**
- e. increased H^+ in the plasma

27. Which of the following can occur when there is a respiratory disorder that decreases ventilation?

- a. metabolic acidosis
- b. metabolic alkalosis
- c. **respiratory acidosis**
- d. respiratory alkalosis

28. What factor drives the increase in ventilation during strenuous exercise?

- a. increased pH
- b. increased PCO_2
- c. decreased PO_2
- d. increased $[\text{HCO}_3^-]$
- e. increased $[\text{H}^+]$**

29. Which of the following increases the cardiac output during exercise?

- a. removal of parasympathetic input to heart
- b. increase of sympathetic input to the pacemaker of the heart
- c. stimulation of increased contractility
- d. increase of sympathetic input to contractile cells
- e. ALL of the above increase cardiac output during exercise**

30. Which of the following dilates arterioles to increase blood flow to exercising skeletal muscles (active hyperemia)?

- a. glucose
- b. norepinephrine
- c. local increase in CO_2**
- d. angiotensin II
- e. vasopressin

END OF TEST

Please turn in your mark-sense form and your question sheets at the front of the room.