

Friday, January 26th, 2024

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.

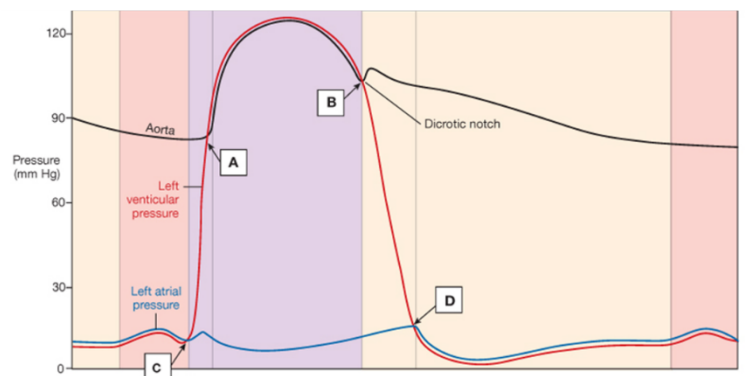
When finished with the test, turn in both the mark-sense form and the exam at the front of the room.

PLACE ALL ANSWERS ON THE MARK-SENSE FORM

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

- Which of the following is TRUE about the papillary muscles?
 - their contraction prevents stenosis of the AV valves
 - their contraction closes the AV valves
 - their contraction prevents prolapse of the AV valves
 - they are the last muscles in the ventricle to contract during systole
 - they contract during diastole to open the AV valves
- Which of these is generally used in the diagnosis of valve disorders?
 - a sphygmomanometer
 - a spirometer
 - a stethoscope
 - electrocardiography
 - an ergometer

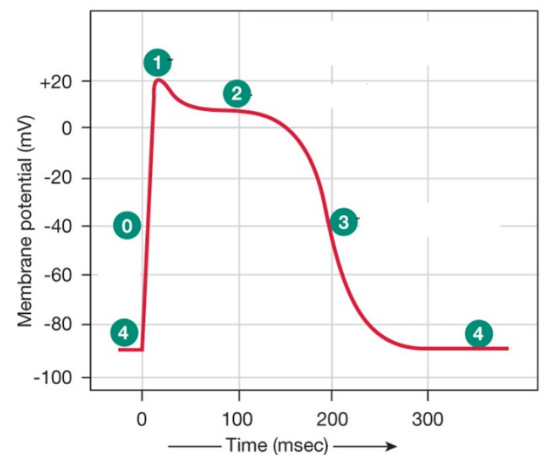
- Refer to the figure. Which letter indicates the time when the aortic valve opens after being closed?
 - A
 - B
 - C
 - D



4. Which of these pressures is typically the lowest?
 - a. diastolic pressure in a brachial artery
 - b. diastolic pressure in a carotid artery
 - c. diastolic pressure in a coronary artery
 - d. systolic pressure in a coronary artery
 - e. systolic pressure in a pulmonary artery

5. What is a key difference between cardiac muscle cells and skeletal muscle cells?
 - a. skeletal muscle cells are striated
 - b. skeletal muscle cells fire action potentials
 - c. Ca^{++} regulates contraction in cardiac muscle cells
 - d. cardiac muscle cells contain sarcoplasmic reticulum
 - e. cardiac muscle cells are electrically coupled

6. Refer to the figure showing a cardiac action potential. What type of ion channel is open during the plateau phase (2 in figure)?
 - a. I_f ("funny" channel)
 - b. Na^+ channel
 - c. K^+ channel
 - d. Ca^{++} channel
 - e. Cl^- channel

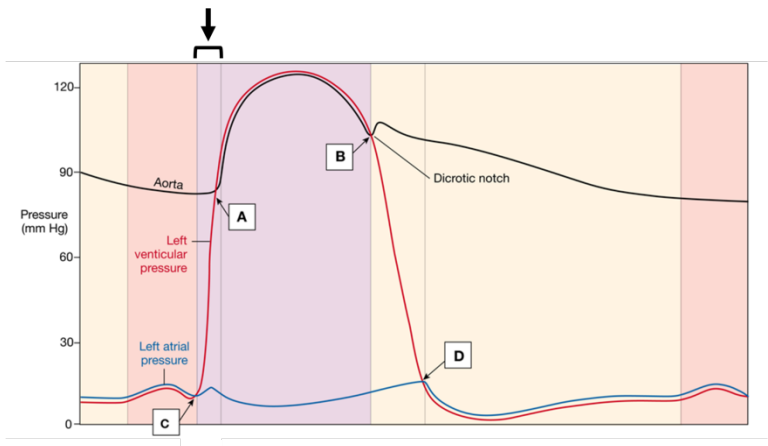


7. In which part of the cardiac conduction system does action potential conduction slow down, allowing the atria to finish contracting before the ventricles start to contract?
 - a. SA node
 - b. AV node
 - c. AV bundle of His
 - d. bundle branches
 - e. Purkinje fibers

8. Which of the following is true about atrial fibrillation?
- is rapidly fatal if not treated immediately
 - the atria don't pump blood
 - increases end-diastolic volume
 - causes an electrocardiogram in which there are no R waves
 - is treated with drugs that lower LDL cholesterol

9. Refer to the figure at right. What specific phase of the cardiac cycle is indicated by the bracket?

- isovolumetric relaxation
- ventricular diastole
- atrial contraction
- atrial systole
- isovolumetric contraction



10. Which of the following **best** describes heart failure?

- cardiac arrest
- blockage of blood flow in a coronary artery
- inadequate cardiac output
- irregular heartbeat
- low blood pressure

11. How does acetylcholine affect the heart?

- increases Ca^{+++} permeability in pacemaker cells
- increases Ca^{++} permeability in contractile cells
- stimulates opening of I_f ("funny") channels
- increases contraction strength
- decreases heart rate

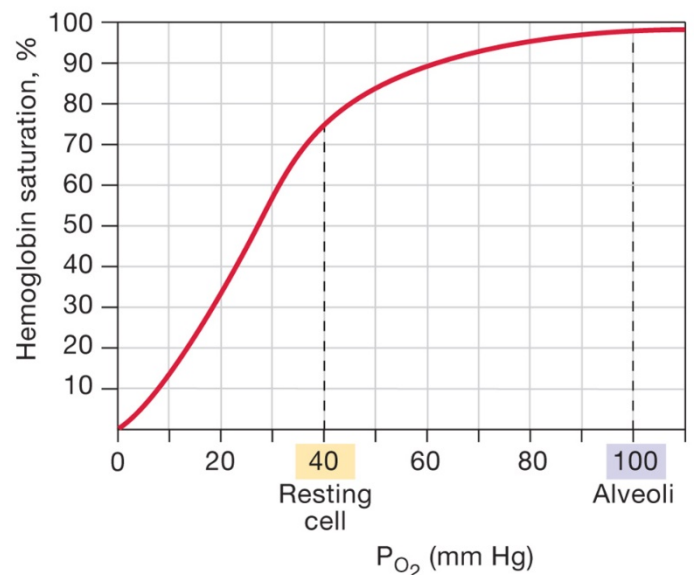
12. Which of the following is NOT an effect of the sympathetic nervous system on cardiovascular function?
- decreases the slope of the pacemaker potential
 - increases release of Ca^{++} from the sarcoplasmic reticulum in heart muscle cells to increase contractility
 - depolarizes pacemaker cells
 - stimulates contraction of smooth muscle in arterioles
 - stimulates contraction of smooth muscle in veins
13. Fill in the blank. Stroke volume increases when _____ increases.
- end-systolic volume
 - total peripheral resistance
 - afterload
 - end-diastolic volume
 - heart rate
14. Preload (the filling of the heart) will increase when which of the following is increased?
- venous return
 - heart rate
 - peripheral resistance
 - angiotensin II
 - increasing all of the above will increase preload
15. Which vessels determine the distribution of blood flow to different tissues?
- large arteries
 - large veins
 - venules
 - arterioles
 - capillaries
16. The carotid baroreceptor reflex is responsible for the homeostatic control of
- central venous pressure.
 - mean arterial pressure.
 - cardiac output.
 - end-diastolic volume.
 - peripheral resistance.

17. Which of the following plays a role in stimulating the unhelpful increase in ECF volume that occurs in heart failure?
- Ca⁺⁺ channels in vascular smooth muscle
 - acetylcholine
 - angiotensin II
 - increased central venous pressure
 - histamine
18. Hypoventilation (lower ventilation than normal) causes
- respiratory acidosis
 - respiratory alkalosis
 - metabolic acidosis
 - metabolic alkalosis
19. Which of the following is NOT a characteristic of asthma?
- airway hyperresponsiveness
 - damage to alveolar tissue
 - increased mucus secretion
 - increased resistance to airflow in the airways
 - inflammation
20. Which of the following is an inflammatory paracrine that promotes airway smooth muscle contraction?
- epinephrine
 - norepinephrine
 - leukotriene
 - angiotensinogen
 - dopamine
21. Which of the following is TRUE about expiration (exhalation) during **quiet breathing**?
- the most important muscle is the diaphragm
 - is a passive process (doesn't require muscle contraction)
 - involves contraction of the external intercostal muscles
 - involves relaxation of the internal intercostal muscles
 - involves contraction of the abdominal muscles

22. The volume of air left in the lungs after someone exhales completely is called the
- residual volume.
 - anatomical dead space.
 - vital capacity.
 - alveolar ventilation.
 - tidal volume.
23. Which of the following is TRUE about surfactant?
- Surfactant is responsible for sticking the pleural membranes together which decreases the work of breathing.
 - Surfactant is secreted by macrophages.
 - Surfactant decreases compliance in the lungs.
 - A deficiency of surfactant causes infant respiratory distress syndrome.
 - Surfactant increases the surface tension of the fluid lining the alveoli.
24. In severe cases of COVID-19, inflammation can lead to acute respiratory distress syndrome (ARDS). Which of the following best describes how ARDS causes respiratory distress?
- paralyzes muscles of respiration
 - inflammation decreases airway resistance to cause an increase in the anatomical dead space
 - decreased fluid secretion leads to thick mucus and decreased mucociliary clearance
 - deficient surfactant secretion increases lung compliance
 - alveoli fill with fluid to increase the diffusion distance for O₂ and CO₂

25. Refer to the figure. At rest, what proportion of the O₂ bound to hemoglobin is given up in the tissues?

- 100%
- about 75%
- about half
- about 40%
- about 25%



26. Which of the following is true about fetal hemoglobin?
- has a higher % saturation with O₂ at a PO₂ of 40 mmHg than maternal hemoglobin
 - has a lower % saturation with O₂ at a PO₂ of 40 mmHg than maternal hemoglobin
 - has a lower binding affinity for O₂ than maternal hemoglobin
 - does not bind O₂
27. What is the sensor that detects changes in the arterial PCO₂?
- respiratory control center in the brainstem
 - central chemoreceptor
 - peripheral chemoreceptor
 - carotid baroreceptor
 - hemoglobin
28. Which of the following causes a bigger increase in ventilation?
- pH increases from 7.42 to 7.44
 - PO₂ increases from 100 mm Hg to 110 mm Hg
 - PO₂ decreases from 100 mm Hg to 90 mm Hg
 - PCO₂ increases from 40 mm Hg to 45 mm Hg
 - PCO₂ decreases from 40 mm Hg to 35 mm Hg
29. What is the neurotransmitter released by the neurons that innervate muscles of respiration?
- histamine
 - norepinephrine
 - acetylcholine
 - epinephrine
 - leukotriene
30. Which of the following most directly causes hyperventilation at the peak of exercise?
- increased PCO₂
 - decreased PO₂
 - increased pH
 - increased [H⁺]
 - decreased PCO₂

END OF TEST

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