

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.

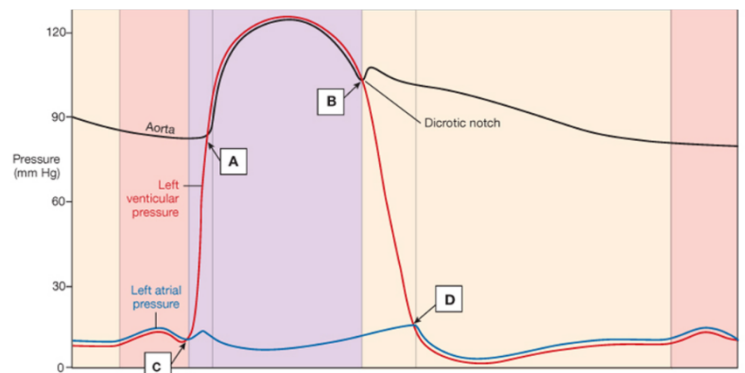
Correct answers are in **red, bold face**.

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

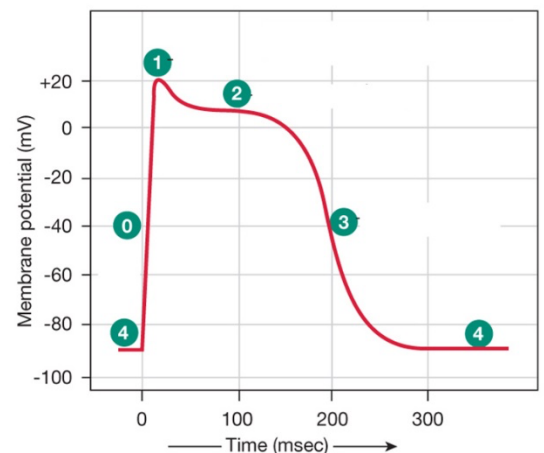
- Which of the following is TRUE about the papillary muscles?
 - their contraction prevents stenosis of the AV valves
 - their contraction closes the AV valves
 - their contraction prevents prolapse of the AV valves**
 - they are the last muscles in the ventricle to contract during systole
 - they contract 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?
- diastolic pressure in a brachial artery
 - diastolic pressure in a carotid artery
 - diastolic pressure in a coronary artery
 - systolic pressure in a coronary artery
 - systolic pressure in a pulmonary artery**
5. What is a key difference between cardiac muscle cells and skeletal muscle cells?
- skeletal muscle cells are striated
 - skeletal muscle cells fire action potentials
 - Ca^{++} regulates contraction in cardiac muscle cells
 - cardiac muscle cells contain sarcoplasmic reticulum
 - 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)?
- I_f ("funny" channel)
 - Na^+ channel
 - K^+ channel
 - Ca^{++} channel**
 - Cl^- channel

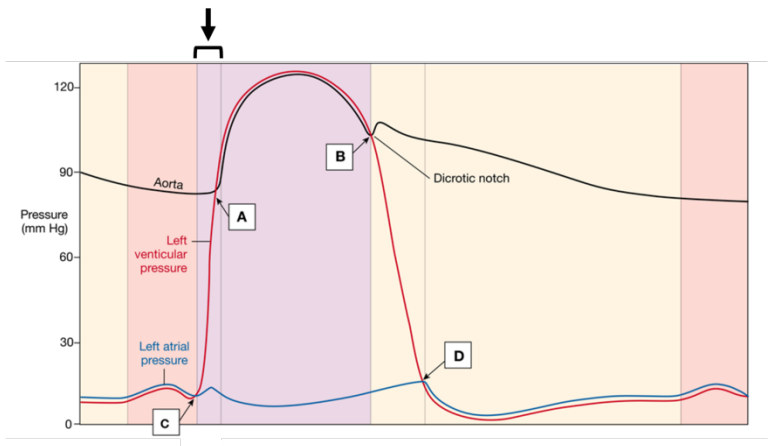


7. In which part of the cardiac conduction system does action potential conduction slow down, allowing the atria to finish contracting before the ventricles start to contract?
- SA node
 - AV node**
 - AV bundle of His
 - bundle branches
 - Purkinje fibers

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?
- a. **decreases the slope of the pacemaker potential**
 - b. increases release of Ca^{++} from the sarcoplasmic reticulum in heart muscle cells to increase contractility
 - c. depolarizes pacemaker cells
 - d. stimulates contraction of smooth muscle in arterioles
 - e. stimulates contraction of smooth muscle in veins
13. Fill in the blank. Stroke volume increases when _____ increases.
- a. end-systolic volume
 - b. total peripheral resistance
 - c. afterload
 - d. **end-diastolic volume**
 - e. heart rate
14. Preload (the filling of the heart) will increase when which of the following is increased?
- a. **venous return**
 - b. heart rate
 - c. peripheral resistance
 - d. angiotensin II
 - e. increasing all of the above will increase preload
15. Which vessels determine the distribution of blood flow to different tissues?
- a. large arteries
 - b. large veins
 - c. venules
 - d. **arterioles**
 - e. capillaries
16. The carotid baroreceptor reflex is responsible for the homeostatic control of
- a. central venous pressure.
 - b. **mean arterial pressure.**
 - c. cardiac output.
 - d. end-diastolic volume.
 - e. 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

- a. **residual volume.**
- b. anatomical dead space.
- c. vital capacity.
- d. alveolar ventilation.
- e. tidal volume.

23. Which of the following is TRUE about surfactant?

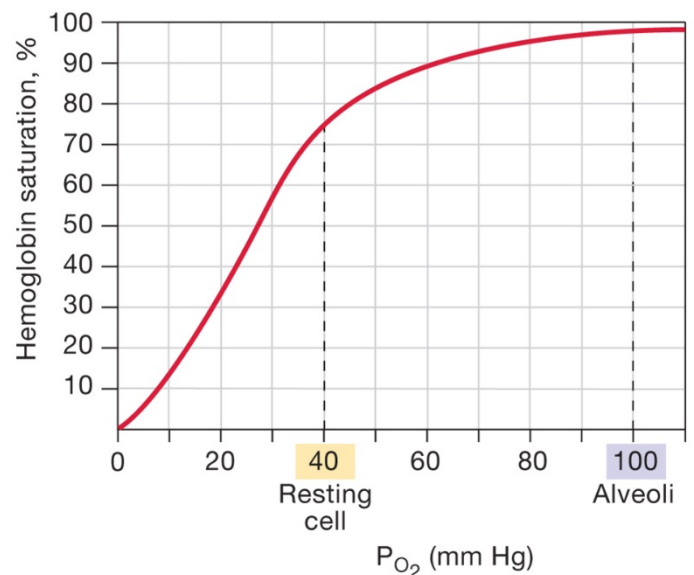
- a. Surfactant is responsible for sticking the pleural membranes together which decreases the work of breathing.
- b. Surfactant is secreted by macrophages.
- c. Surfactant decreases compliance in the lungs.
- d. **A deficiency of surfactant causes infant respiratory distress syndrome.**
- e. Surfactant 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?

- a. paralyzes muscles of respiration
- b. inflammation decreases airway resistance to cause an increase in the anatomical dead space
- c. decreased fluid secretion leads to thick mucus and decreased mucociliary clearance
- d. deficient surfactant secretion increases lung compliance
- e. **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?

- a. 100%
- b. about 75%
- c. about half
- d. about 40%
- e. **about 25%**



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

END OF TEST

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