

Circulatory and Respiratory Systems Concept Questions

1. a) What causes a pulse? (When the ventricles contract, blood pressure increases and blood rushes into the arteries, causing them to expand. We feel the expansion as the pulse.)
b) Why can the pulse rate be used to measure the heart rate? (The pulse is caused by the heart pumping blood so the pulse will correspond to the heart rate.)
2. Using examples, explain the purpose served by vasoconstriction and vasodilation. (For cooling, vasodilation of surface arterioles can direct more blood to the skin shedding heat. This causes flushing of the skin. For conserving heat, vasoconstriction of surface arterioles can direct blood away from the skin to reduce heat loss to the environment. The skin appears pale.)
3. What is unusual about the pulmonary arteries and veins? (Pulmonary arteries carry deoxygenated blood and the pulmonary veins carry oxygenated blood. This is the reverse of all other arteries and veins.)
4. What function do capillaries serve? (Capillaries are tiny blood vessels. All the exchange between the blood and body cells happens across the membranes of the cells of the capillaries.)
5. Explain how chronic starvation can lead to edema. (Plasma proteins are digested which decreases the osmotic pressure of the blood. More fluid stays in the tissues, causing swelling.)
6. a) You bump into Joe on the Street at McDonalds and he says he doesn't understand what causes a head rush and complains that he hates getting one. You excitedly say that you have the explanation and the solution. What do you say? (Blood pressure in veins is insufficient to return blood to the heart. When standing quickly, the heart is unable to overcome gravity so the brain is deprived of oxygen briefly. By flexing arms and legs, the veins, with their one-way valves, are squeezed by skeletal muscles, contributing to circulation and avoiding orthostatic hypotension.)
b) Joe then asks if arteries have those nifty valves also. (No. The heart provides enough pressure to circulate blood through arteries.)
7. It is not unheard of for soldiers to faint while standing at attention for a long period of time. Explain. (Without skeletal muscle movement, blood would pool in the legs. Without sufficient blood supply to the brain a person would pass out.)
8. Occasionally, a child is born with an opening in the wall between the right and left ventricles. Explain how such a defect might affect the child? (There would be mixing of oxygenated and deoxygenated blood. The resulting decrease in oxygen delivery to the body would cause lethargy.)
9. Why are the atrioventricular valves and the semilunar valves so important? (The AV valves prevent the flow of blood back into the atria when the ventricles contract. The semilunar valves prevent the flow of blood from the aorta back into the ventricles when they relax. Without them, blood flow from the heart would be reduced.)
10. The artificial pacemaker is a small battery-powered device that can send small electric impulses to the heart. What is its function and why would one be necessary? (It generates electrical impulses to coordinate the contraction of heart muscle cells. This is required in patients whose heart beat might be irregular or whose natural pacemaker has been damaged by heart attack.)
11. You visit the doctor and have your blood pressure measured.

- a) It is 150/110. Is this high? (This is considered a high blood pressure.)
- b) Why might the doctor be more concerned with diastolic pressure than with your systolic pressure? (The doctor *may* be more concerned with diastolic pressure because a high pressure during ventricular relaxation could be more concerning.)
12. Imagine that you are a doctor and that you have diagnosed one of your patients as having high blood pressure. You prescribe a low salt diet. Why? (A high salt diet increases the osmotic flow of water into the blood, increasing blood pressure. This puts strain on the heart which can contribute to a heart attack.)
13. What is the adaptive value of the fact that arteries are usually located far below the skin? (Blood in arteries is at a higher pressure so more blood is lost from an artery than from a vein when one is severed. Extra protection results from having the arteries deeper under the skin.)
14. What are the primary causes of heart attacks? (Atherosclerosis, smoking, and chronic high blood pressure.)
15. How can atherosclerosis result in high blood pressure? (Narrowing of the arteries increases the pressure. The heart must pump faster and harder to get the same volume of blood through.)
16. While recent research has called this into question, for decades we thought there was a connection between a high fat diet and heart disease. What is the connection? (A high fat, high cholesterol diet can result in deposits of fat on artery walls, decreasing their diameter. This increases blood pressure and can cause heart attack or stroke if a clot gets trapped. Chronic strain on the heart can also result in heart attack.)
17. a) What is an aneurysm? (When the wall of an artery becomes weakened it bulges out.)
- b) Why are they dangerous? (As the aneurysm increases in size, the risk of rupture increases. A rupture results in severe hemorrhage which can lead to death.)
18. Imagine now that you became bored with the mundane life of a family physician and decided to become an Emergency Medicine Technician. At the scene of a car accident, a victim has lost a great deal of blood and is going into shock. The symptoms you observe are weak and rapid pulse, and falling body temperature. Explain. (Loss of blood volume leads to a weakened pulse. The heart tries to compensate by beating faster giving a rapid pulse. The loss of blood contributes to the lower temperature.)
19. Why might a person with anemia or a low RBC count feel tired all the time? (Iron is needed for hemoglobin to carry oxygen. With a lack of iron, hemoglobin carries less oxygen so less energy can be produced from food.)
20. What would happen if a blood clot formed in a major artery? (The part of the body supplied by that artery would be deprived of oxygen.)
21. Aspirin reduces the ability of blood to form clots. Why do you think doctors prescribe aspirin to patients who have had a heart attack or stroke? (It reduces the chance of a clot forming again and causing another heart attack or stroke.)
22. a) Why would someone with hemophilia have to be careful not to cut himself or herself? (They have an absent or defective clotting factor so they could lose lots of blood even from minor bleeding.)
- b) How would injections of clotting proteins help a patient with hemophilia? (Injections would provide the missing clotting factors and help reduce the risk of the disease.)

23. a) Why is a large surface area important for a respiratory surface? (A large surface area increases the gas exchange.)
b) How does the human respiratory system achieve a large surface area? (Bronchioles branch into smaller and smaller tubes and terminate in tiny sacs called alveoli.)
24. Joe on the street stops you and says “Hey, buddy. How do we breathe anyway?” What do you say? (As the diaphragm drops, the chest cavity expands and pressure decreases. The decreased pressure allows air to enter the lungs. The reverse happens when during exhalation.)
25. When you are exercising, your respiratory rate increases. Explain how this happens. (Sensors in the aorta and carotid arteries detect carbon dioxide in the blood. An increase in carbon dioxide means oxygen is being used so respiratory rate increases.)
26. The breathing control center responds to the level of carbon dioxide in the blood - not the level of oxygen. What consequence would this have for people at high altitude where there is less oxygen? (At high altitude, the level of carbon dioxide in the blood is normal so the breathing control center does not increase the rate of breathing. The result is lack of oxygen.)
27. A friend of yours is a smoker. Use your knowledge of the respiratory system to try to convince them to quit. (Smoking causes increased mucus production and damage to cilia. The mucus can be difficult for cilia to clear so it becomes polluted with bacteria or other pathogens and contaminants. Smoking can also lead to emphysema and dramatically increases your risk of lung cancer.)