A) reflex arcs involving baroreceptors  
B) reflex arcs associated with efferent fibers  
C) reflex arcs associated with vasomotor fibers  
D) chemoreceptors  
Answer: B  
Diff: 1    Page Ref: 727–728  

44) Secondary hypertension can be caused by _______.  
A) obesity  
B) stress  
C) arteriosclerosis  
D) smoking  
Answer: C  
Diff: 1    Page Ref: 733  

45) Where in the body would you find low oxygen levels causing vasoconstriction and high levels causing vasodilation?  
A) kidney  
B) lungs  
C) liver  
D) heart  
Answer: B  
Diff: 2    Page Ref: 738  

46) Normal blood pressure for an adult at age 65 is _______.  
A) 120/80  
B) 90/55  
C) 150/90  
D) 130/80  
Answer: C  
Diff: 2    Page Ref: 743
1) The first major branch of the aortic arch is the ________ branch.
   Answer: brachiocephalic
   Diff: 1    Page Ref: 746

2) The embryonic mesodermal cells that will eventually form the endothelial lining of blood vessels are called ________.
   Answer: blood islands
   Diff: 2    Page Ref: 743

3) The most common form of shock is ________.
   Answer: hypovolemic
   Diff: 1    Page Ref: 740

4) ________ is one of the most potent vasoconstrictors known and it is one of the endothelium-derived factors.
   Answer: Endothelin
   Diff: 2    Page Ref: 729–730

5) A ________ capillary has many oval holes in it.
   Answer: fenestrated
   Diff: 1    Page Ref: 720

6) Arterial ________ provide alternate pathways for blood to get to an organ.
   Answer: anastomoses
   Diff: 1    Page Ref: 723

7) The ________ in the carotid sinuses and aortic arch detect increases in blood pressure.
   Answer: baroreceptors
   Diff: 1    Page Ref: 727

8) The ________ artery is a blood vessel on the arm used as a pressure point.
   Answer: brachial
   Diff: 1    Page Ref: 732

9) ________ shock is due to abnormal expansion of blood vessels and a rapid drop in blood pressure.
   Answer: Vascular
   Diff: 1    Page Ref: 742

10) The third major branch of the aortic arch is the ________ artery.
    Answer: left subclavian
    Diff: 1    Page Ref: 746

11) The ________ supply the brain with blood.
    Answer: internal carotid arteries
    Diff: 1    Page Ref: 748

12) ________ pressure is the difference between systolic and diastolic pressure.
    Answer: Pulse
    Diff: 1    Page Ref: 725

13) Blood flow equals the difference in blood pressure divided by ________.
    Answer: peripheral resistance
    Diff: 2    Page Ref: 724
14) The lowest venous blood pressure is found in the ________.
Answer: vena cavae
Diff: 2 Page Ref: 725–726

15) As a cuff is deflated on the arm, sounds of ________ can be heard.
Answer: Korotkoff
Diff: 2 Page Ref: 732

16) Which type of blood vessels contain valves and what is their function?
Answer: Veins and venules contain valves to prevent blood from flowing backward. This is necessary because the venous vessels are a low-pressure system and the blood must sometimes flow against gravity, particularly in the limbs.
Diff: 2 Page Ref: 722

17) Describe the forces that determine fluid movements across capillary walls.
Answer: (1) Capillary hydrostatic pressure (equal to capillary blood pressure) tends to force fluid out of capillaries into the interstitial spaces. (2) Osmotic pressure, created by large nondiffusible particles in the blood, tends to draw water into the capillaries. At the arterial end of the capillary bed, hydrostatic forces dominate and fluid moves out, while at the venous end, osmotic forces dominate and the net fluid movement is into the capillaries.
Diff: 3 Page Ref: 738–739

18) Define vasoconstriction and vasodilation. What is the mechanism of regulation?
Answer: Vasoconstriction is a reduction in the lumen diameter of a blood vessel due to smooth muscle contraction. Vasodilation is a widening of the lumen due to smooth muscle relaxation. Both are regulated by vasomotor nerve fibers of the sympathetic division of the autonomic nervous system.
Diff: 2 Page Ref: 714

19) Consider the diameter of one 4-mm blood vessel and two 2-mm blood vessels. Would the two 2-mm vessels carry more, less, or the same amount of fluid, given that pressure is a constant? Why?
Answer: The two 2-mm vessels would deliver considerably less fluid for two reasons: (1) the resistance in the smaller vessels is much greater and (2) the volume of the 4-mm vessel is greater than that of two 2-mm vessels. Draw a 4-inch circle; then put two 2-inch circles in it and notice the volume difference.
Diff: 3 Page Ref: 724

20) Based on what we have learned about the regulation of blood flow to various organs, do you think it is wiser to rest or exercise after a heavy meal? Explain your answer.
Answer: At rest, the abdominal organs receive approximately 24% of the total blood flow. With exercise, blood flow is shifted away from abdominal organs to skeletal muscles. It would therefore be wiser to rest after a heavy meal to allow optimum function of the organs of digestion and absorption of nutrients.
Diff: 3 Page Ref: 737

21) The average thickness of an arteriole is six times that of the average venule, why?
Answer: The arteriole wall still contains some smooth muscle and some elastic fibers which tend to be quite thick at times. The venule, on the other hand, is more like a giant capillary with only occasional smooth muscle fibers wrapped around it.
Diff: 2 Page Ref: 717, 722

22) Why do the blood vessel colors appear backwards on the models of the heart and the lungs?
Answer: They are backwards! The pulmonary vessels appear backwards from the rest of the body because the heart is pumping deoxygenated blood to the lungs and oxygenated blood toward the heart.
Diff: 1 Page Ref: 744
23) The abdominal aorta divides into three arteries at its terminus, what are they?
Answer: Left and right common iliac arteries and the median sacral artery.
Diff: 2  Page Ref: 752

24) The mesenteric arteries branch off the abdominal aorta, but the mesenteric veins do not connect directly to the vena cava, why?
Answer: The mesenteric veins merge into the hepatic portal vein before entering the liver. The liver dumps into the vena cava.
Diff: 2  Page Ref: 764

Clinical Questions

1) Describe the effect of hypovolemic shock on the blood vessels and the heart.
Answer: Hypovolemic shock causes blood vessels to constrict to increase venous return and maintain pressure. Heart rate increases to compensate for loss of blood pressure and to maintain cardiac output. If volume loss continues, pressure eventually drops sharply and the shock becomes irreversible, leading to death.
Diff: 3  Page Ref: 740–741

2) Atherosclerosis is a progressive disease of blood vessels that is responsible for millions of deaths each year. Describe the disease process, noting the involvement of specific cell/tissue types and molecules.
Answer: The disease process involves several stages and usually affects the aorta and coronary arteries. The initial event involves damage to the tunica intima caused by bloodborne chemicals or physical factors such as a blow or infection. Injured endothelial cells release chemicals that increase the uptake by the endothelium of fats, LDLs, and cholesterol. This eventually attracts macrophages that ingest the oxidized fats and, along with smooth muscle cells from the tunica media, transform into foam cells. Foam cells become fatty streaks, which, along with collagen and elastin fibers secreted by smooth muscle cells, form atherosclerotic plaques. These protrude into the lumen and narrow the blood vessels. Arteriosclerosis follows when smooth muscle cells in the tunica media die, being replaced by nonelastic scar tissue.
Diff: 3  Page Ref: 718–719

3) A woman in her early 50s appeared at a walk-in clinic, complaining of aching pain in her right leg following a fall. Visual examination revealed that the medial aspect of that leg was red and swollen. A diagnosis of phlebitis was made. What is phlebitis, and what more serious condition may result if proper healing does not occur?
Answer: Phlebitis is an inflammation of a vein accompanied by painful throbbing and redness of the skin over the inflamed vessel. Thrombophlebitis (clot formation) can result if proper healing does not occur. The danger in thrombophlebitis is the possibility that a clot could detach and form an embolus.
Diff: 3  Page Ref: 767

4) For each of the following situations, describe the anticipated effect on blood pressure and the physiological basis of the response: (1) a high-salt diet, (2) a blow on the head that damages (disables) the vasomotor center, (3) an attack by a mugger, and (4) a hypothalamic tumor resulting in excess ADH production.
Answer: (1) A high-salt diet causes increased sodium in the blood, which increases osmotic pressure in the capillaries and thus increases blood volume and blood pressure. (2) Damage to the vasomotor center will cause a loss of vasomotor tone and a drop in blood pressure because the vasomotor center is the integrating center for blood pressure control. (3) During the mugger attack, blood pressure would increase due to sympathetic nervous system stimulation (the fight-or-flight response) triggered by the hypothalamus. (4) Excess ADH production would cause an increase in blood pressure through increased water retention and therefore increased blood volume. ADH also stimulates vasoconstriction.
Diff: 3  Page Ref: 726–731
5) Mrs. Gray, a 50-year-old mother of seven children, is complaining of dull, aching pains in her legs. She reports that they have been getting progressively worse since the birth of her last child. During her physical examination, numerous varicosities are seen in both legs. How are varicosities recognized? What veins are most likely involved? What pathologic changes have occurred in these veins, and what is the most likely cause in this patient’s case?

Answer: Varicosities are recognized by the enlargement of the veins. Superficial veins are most likely involved because they have little support from surrounding tissues. The veins have become tortuous and dilated because of incompetent valves that allow the blood to pool, stretching the vein walls. The likely cause in this patient’s case is her pregnancies, because the enlarged uterus exerts downward pressure on groin vessels, restricting return blood flow to the heart.

Diff: 3 Page Ref: 722–723

6) Mr. Wilson is a 45-year-old stockbroker with essential hypertension. He is African American, obese, and he smokes 2–3 packs of cigarettes daily. What risk factors for hypertension are typified by Mr. Wilson? What steps should be taken to treat Mr. Wilson, and what lifestyle changes should he make? What complications are likely if corrective steps are not taken?

Answer: The risk factors are obesity, race, a high-stress job, and smoking. Mr. Wilson should lose weight, reduce salt intake, quit smoking, and try to reduce his stress level, perhaps by relaxation training. Medical intervention could include treatment with diuretics, sympathetic nerve blockers, calcium channel blockers, and angiotensin-converting enzyme inhibitors. Complications could include atherosclerosis, heart failure, renal failure, and stroke.

Diff: 3 Page Ref: 733

7) A pregnant patient comes into a clinic and asks about a small dark bulge that is becoming more apparent on her leg. What is it and what caused it?

Answer: The patient is getting a varicose vein. Due to the growing fetus putting downward pressure on the vessels of the groin and restricting the return of blood to the heart, the valves in the peripheral veins begin to fail. This causes blood pooling, which enlarges these veins and puts additional strain on other peripheral vein valves down the line.

Diff: 3 Page Ref: 722–723

8) At the battle of Shiloh in the American Civil War, Confederate General A. S. Johnston was killed when he was shot in the thigh. Witnesses reported that he bled to death almost before he realized that he was wounded. Which blood vessel was most likely to have been injured? Why is a tourniquet usually ineffective in stopping the bleeding from this wound?

Answer: The wound severed his femoral artery, the largest artery serving the lower limb. A tourniquet may be ineffective because it is a high-pressure, deep artery with a large diameter. It is therefore difficult to exert enough pressure through the thigh muscles to stop the bleeding.

Diff: 3 Page Ref: 756

9) A client lost a lot of blood during surgery and his blood pressure dropped from 120/80 to 90/50. Describe how the kidneys respond to this change in blood pressure.

Answer: When arterial blood pressure declines, special cells in the kidneys release the enzyme renin into the blood. Renin triggers a series of enzymatic reactions that produce angiotensin II, which is a potent vasoconstrictor. Angiotensin causes an increase in systemic blood pressure, and increases the rate of blood delivery to the kidneys and renal perfusion. It also stimulates the adrenal cortex to secrete aldosterone, a hormone that enhances renal reabsorption of sodium, and prods the posterior pituitary to release ADH, which promotes more water reabsorption. As sodium moves into the blood stream, water follows; thus both blood volume and blood pressure rise.

Diff: 3 Page Ref: 730–731
10) A client has an 80% blockage of his left anterior descending coronary artery. Describe what occurs in terms of myocardial oxygen supply and demand if his sympathetic nervous system is stimulated.
Answer: When the sympathetic nervous system is stimulated there is increased myocardial contractility, which increases cardiac output and blood flow to active muscles. This increases the demand for oxygen to the cells. The coronary artery is a major blood vessel of the heart. When the demand for myocardial oxygen exceeds the ability of the coronary arteries to supply it, death of tissue can occur.