**Review questions for Cardiovascular system lecture**

**Multiple choice review questions:**

1) Within the pulmonary loop, the

 A) pulmonary arteries carry oxygen-poor blood.

 B) pulmonary veins carry blood toward the lungs

 C) blood returning to the left atrium of the heart is oxygen-poor.

 D) oxygen from the blood diffuses into the lungs.

2) The atrioventricular (AV) valves

 A) are located between the atria and the vena cava

 B) are located between the ventricles and the aorta

 C) are located between the ventricles and the atria

 D) normally prevent the backflow of blood from the atria to the ventricles.

3) The semilunar valves

 A) prevent the backward flow of blood from the ventricles into the atria.

 B) are open during the relaxation phase of the ventricles.

 C) are closed throughout the cardiac cycle

 D) regulate the passage of blood from the ventricles into the pulmonary

 artery and the aorta.

4) The terms "systole" means \_\_\_\_\_ and the term "diastole" means \_\_\_\_\_.

 A) Relaxation of a heart chamber Relaxation of a blood vessel

 B) Contraction of a heart chamber Contraction of a blood vessel

 C) Contraction of a heart chamber Relaxation phase of the ventricles

 D) Relaxation of a heart chamber Contraction of a heart chamber

5) The second heart sound (“dup”) results from vibrations generated by the

 A) opening of the AV valves at the start of diastole.

 B) closing of the AV valves at the start of systole.

 C) opening of the semilunar valves at the start of systole.

 D) closing of the semilunar valves at the start of diastole.

6) The \_\_\_\_\_\_ is the normal pacemaker of the heart.

 A) AV bundle

 B) Left atrium

 C) right atrium

 D) SA node

7) Action potentials in heart cells require (and can be altered by) all of these ions except

 A) Na+

 B) Cl-

 C) K+

 D) Ca2+.

8) An important function of the AV node is to

 A) rapidly transmit action potentials to the surface of the atria

 B) delay the conduction of the action potential from the atria to the

 ventricles.

 C) serve as a conduit for rapid transmission of action potentials to blood

 vessels

 D) serve as a pacemaker for the contraction of cardiac muscle.

9) The inner most layer of the blood vessels is called the

 A) tunica externa.

 B) tunica media.

 C) tunica interna

 D) vasomedia

10) Which of the following statements about arteries and veins is false?

 A) Arteries have more smooth muscle for their diameters than do comparable veins.

 B) Arteries carry blood transported under higher pressure than blood carried by veins.

 C) Only veins have one-way valves to promote flow in one direction.

D) The body changes the diameter of veins to control blood flow to organs

11) The body changes the blood flow to organs mostly through changes in \_\_\_\_\_\_

 A) vessel radius.

 B) blood viscosity.

 C) vessel length.

 D) pressure differential.

12) The skeletal muscle pump can directly increase

 A) cardiac output.

 B) blood volume.

 C) heart rate.

 D) venous return of blood to heart.

13) The exchanges of gases and nutrients between the blood and the tissues occur in blood vessels called

 A) arteries.

 B) arterioles.

 C) capillaries.

 D) veins.

14) The sinoatrial node depolarizes more frequently under the influence of

 A) norepinephrine

 B) acetylcholine

 C) TPA

 D) ECG

15) At rest the heart of an average human will pump \_\_\_\_\_\_\_\_ milliliters of blood per minute.

 A) 3000

 B) 5000

 C) 7000

 D) 9000

16) During normal ventricular contraction what volume of blood is ejected as the stroke volume?

 A) 5 liters

 B) 5 ml

 C) 70 ml

 D) 1.25 liters

18) The amount of blood pumped by one ventricle in one minute, is called the

 A) stroke volume.

 B) end-diastolic volume.

 C) ejection fraction.

 D) cardiac output.

19) An increase in \_\_\_\_\_\_ will always cause an increase in stroke volume.

 A) cardiac output.

 B) end diastolic volume

 C) peripheral resistance.

 D) blood pressure

20) If someone's heart has a stroke volume of 0.07 liters (70 ml) and a heart rate of 90 beats/minute, the cardiac output would be

 A) 6300 ml/min.

 B) 770 ml/min.

 C) 70 ml/min.

 D) 1.28 ml/min.

21) The kidneys increase blood volume by adding \_\_\_\_\_ to the blood

 A) proteins

 B) Na+

 C) epinephrine

 D) lactic acid

22) Activation of angiotensin II in the blood can...

 A) cause vasodilation of arterioles and muscular arteries.

 B) inhibit the sense of thirst.

 C) cause the kidneys to remove sodium from the blood.

 D) raise the blood pressure.

23) This substance is called a clot buster, and is often immediately given to people suffering from a heart attack or stroke.

 A) anti-embolane

 B) thrombin

 C) TPA (tissue plasminogen activator)

 D) fibrin

24) A person who does not have chest pain but who suffers from constant pulmonary edema, swelling in the legs, and fatigue is most likely to have...

 A) heart attack.

 B) anaphylactic shock.

 C) fibrillations.

 D) congestive heart failure.

26) For a person with severe allergies to bee venom, a bee sting is most likely to cause

 A) congestive heart failure

 B) anaphylactic shock.

 C) heart attack

 D) acute hypertension

**Answer to multiple choice review questions:**

1 = A

2 = C

3 = D

4 = C

5 = D

6 = D

7 = B

8 = B

9 = C

10 = D

11 = A

12 = D

13 = C

14 = A

15 = B

16 = C

18 = D

19 = B

20 = A

21 = B

22 = D

23 = C

24 = D

26 = B

**Fill-in-the-blank review questions:**

1) The path of blood from the heart, through the lungs, and back to the heart is known as the \_\_\_\_\_\_\_ loop. The path of blood from the heart, to all the organs of the body (except the lungs), and back to the heart is known as the \_\_\_\_\_\_\_ loop.

2) After each description below, write P if it matches the pulmonary loop and write S if it matches the systemic loop. Some blanks may require both answers.

 a) It goes to the lungs and back:

 b) The blood in its arteries is blue:

 c) Oxygen enters the blood in this loop:

 d) It begins at the heart:

 e) The blood in its arteries is red:

 f) CO2 is present in some or all of this loop:

3) \_\_\_\_\_ is the term for any blood vessel in the body that carries blood away from the heart.

4) \_\_\_\_\_ is the term for any blood vessel in the body that carries blood toward the heart.

5) The word \_\_\_\_\_ refers to lungs, and so the veins returning blood to the heart from the lungs are

called the \_\_\_\_\_ veins.

6) The two uppermost chambers of the heart are the \_\_\_\_\_.

7) The two lowermost chambers of the heart are the \_\_\_\_\_.

8) The muscular wall of each \_\_\_\_\_ (a heart chamber type) is small because its job is simply to pump blood a few inches into the next heart chamber.

9) The right atrium receives blood from two major veins: the superior and inferior \_\_\_\_\_.

12) Write T(rue) or F(alse) in each blank space:

 a) The ventricles are refilled with blood in diastole\_\_\_\_\_\_\_

b) The semilunar valve is between the atrium and the

 ventricle\_\_\_\_\_\_

 c) Blood in pulmonary loop arteries is blue \_\_\_\_\_\_\_\_\_\_

 d) The left and right atria contract at the same time\_\_\_\_\_

 e) The left and right ventricles contract at the same time\_\_\_\_\_\_

13) After each description, write LV if it applies to the left ventricle, write RV if it applies to the right ventricle, write LA if it applies to the left atrium, and write RA if it applies to the right atrium. Some descriptions may match more than one answer. Write all matching answers.

 a) Contracts at the same time as the right ventricle \_\_\_\_\_\_\_\_\_

 b) Pumps blood out of the heart \_\_\_\_\_\_\_\_\_\_

 c) Pumps blood within the heart \_\_\_\_\_\_\_\_\_

 d) Has semilunar valves at its exit \_\_\_\_\_\_\_\_\_\_

 e) Has cardiac muscle walls \_\_\_\_\_\_\_\_\_

 f) Carries oxygenated blood \_\_\_\_\_\_\_\_\_

g) Carries deoxygenated blood \_\_\_\_\_\_\_\_\_

14) You are a red blood cell that is about to return to the heart after passing through the systemic loop. Starting with the right atrium as "1", number the following components of the cardiovascular system in the correct order that you would encounter them.

 Right atrium 1

Left atrium \_\_\_\_

 Right ventricle \_\_\_\_

Left ventricle \_\_\_\_

 Pulmonary artery \_\_\_\_

Pulmonary vein \_\_\_\_

 Aorta \_\_\_\_

Right AV valve \_\_\_\_

Left AV valve \_\_\_\_

Lungs \_\_\_\_

Aortic semi-lunar valve \_\_\_\_

Pulmonary semi-lunar valve \_\_\_\_\_

15) Using the list of cardiovascular system parts listed in problem 14 as possible answers, list the parts of the cardiovascular system that carry oxygenated blood.

16) The two large arteries leaving the heart (one from the right ventricle and one from the left ventricle) are the \_\_\_\_\_ and the \_\_\_\_\_.

17) Most of the work of the heart is performed by the \_\_\_\_\_\_\_ ventricle as it forces blood into the aorta.

18) The larger, more muscular chambers of the heart are the \_\_\_\_\_\_ (a chamber type).

19) The \_\_\_\_\_ (which chamber of the heart?) pumps blood to the lungs; the \_\_\_\_\_ (which

chamber of the heart?) pumps blood to the body via a huge artery called the aorta.

20) The amount of force required to pump blood through the entire body is greater than the

force needed to pump blood through the lungs, so the \_\_\_\_\_ ventricle is larger and more muscular than the \_\_\_\_\_ ventricle.

21) Blood has to travel further in the \_\_\_\_\_ loop than in the \_\_\_\_\_ loop: and therefore there

is more friction and more strength is required to keep it moving.

22) Blood in the pulmonary veins is higher/lower (circle one) in oxygen compared to blood in the pulmonary arteries.

23) The \_\_\_\_\_\_\_ valves separate the atria from the ventricles.

24) The \_\_\_\_\_\_\_ valves are located at the start of the pulmonary artery and the aorta and prevent the back flow of blood into the ventricles.

25) The AV valves and the semilunar valves open and then slam shut with each beat of the heart. This constant opening and closing would damage most tissues, but the heart valves are not harmed because they are made of a very strong and tough leather-like tissue. What tissue are they made out of? (hint: It may help to review the tissue types chapter)

26) (True or False) There are no valves preventing backflow of blood from the heart into the

veins that return blood to the heart.

28) The \_\_\_\_\_ valves prevent backflow into the atria when the ventricles contract/relax (circle one).

29) The \_\_\_\_\_ valves prevent backflow of blood leaving the heart when the ventricles contract/relax (circle one).

38) The \_\_\_\_\_ (which chamber of the heart?) receives blood that has just left the lungs.

40) \_\_\_\_\_ refers to the time when heart chambers are contracting, while \_\_\_\_\_ refers to the time when heart chambers are relaxing.

41) The first heart sound is caused by closure of the \_\_\_\_\_\_\_ valves and the second heart sound is caused by closure of the \_\_\_\_\_\_\_ valves.

42) During ventricular systole, the atria are in \_\_\_\_\_.

43) At the end of each cardiac cycle, ventricles are in diastole/systole (circle one) and the atria are in

diastole/systole (circle one).

44) Write the letters of all descriptions below that occur when the atria begin contracting.

a) Semilunar valves open b) Ventricles begin systole

c) Ventricles are in diastole d) AV valves are shut

e) The “lub” sound occurs f) The “dup” sound occurs

g) The atria are in diastole

45) Using the same letters listed in problem 44, write the letters of all descriptions below that occur when the atria begin relaxing.

46) Using the same letters listed in problem 44, write the letters of all descriptions below that occur when the ventricles begin contracting.

47) Using the same letters listed in problem 44, write the letters of all descriptions below that occur when the ventricles begin relaxing.

48) The heart beat sounds are often described as lub-dup, pause, lub-dup, pause, etc. Write the letters of all events listed below that occur when the lub sound occurs.

 a) The atria are relaxing b) The atria are contracting

 c) The ventricles are relaxing d) The ventricles are contracting

49) Using the letters from problem 48, write the letters of all events listed below that occur when the dup sound occurs.

52) The semilunar valves are open/closed (circle one) during contraction of the ventricles.

53) The first of the two heart sounds (“lub”) is due to the \_\_\_\_\_ valves closing.

54) The second of the two heart sounds occurs when the \_\_\_\_\_ valves shut.

55) The specialized heart tissue that generates and conducts action potentials to cause the heart chambers to contract and relax is called the \_\_\_\_\_\_ tissue of the heart.

56) The normal beating of the heart is initiated by the \_\_\_\_\_ node, a cluster of conducting tissue

in the \_\_\_\_\_\_ chamber of the heart. Because this clump of conducting tissue sets the overall heart rate, it is often called the \_\_\_\_\_\_ of the heart.

57) After the SA node, the next major clump of conducting tissue is the \_\_\_\_\_ node. This node receives signals from the SA, and delays briefly, and then sends the signals downward toward the ventricles.

58) The AV node is located in the \_\_\_\_\_\_\_ chamber of the heart.

59) Like neurons, heart cells require the ions Na+ and K+ to depolarize and repolarize. But unlike neurons, heart cells also require the ion \_\_\_\_\_\_\_ to depolarize.

60) Abnormal rapid chaotic contraction and relaxation of the heart (when there is no effective pumping of blood) are called \_\_\_\_\_\_\_.

69) The central space in a blood vessel through which blood flows is called the \_\_\_\_\_\_.

70) The innermost wall of the blood vessels is called the \_\_\_\_\_ and it is made of \_\_\_\_\_ (which tissue type?).

71) \_\_\_\_\_ is the middle tunic of blood vessels, and primarily consists of \_\_\_\_\_ tissue.

72) The \_\_\_\_\_ refers to the outermost layer of the blood vessel wall. Its function is to \_\_\_\_\_\_.

73) The outermost layer of blood vessels is composed mostly of \_\_\_\_\_ tissue.

74) \_\_\_\_\_\_\_ (a blood vessel type), because of their thicker muscular layer, have a narrower lumen than the \_\_\_\_\_\_\_ (another blood vessel type).

75) Below is a diagram of a blood vessel. The inner white circle is the lumen (hollow space where the blood flows through). All the other circles are layers of tissue. In each blank label, write the name of the tissue layer and write the type of tissue it is composed of. Be as specific as possible for full credit.

 a)

 b)

 c)

76) Judging from the thinness of the middle layer of the above diagram, the blood vessel is probably an artery/vein (circle one)

77) The effect of the contraction of skeletal muscle on blood flow through the veins is often described as the skeletal muscle \_\_\_\_\_\_ because it helps to return blood to the heart.

78) To increase the amount of blood flow to an organ, the \_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ (two blood vessel types) leading to that organ undergo \_\_\_\_\_\_\_.

79) The smallest arteries are called \_\_\_\_\_\_.

80) The smallest veins are called \_\_\_\_\_\_.

81) When the lumen of a blood vessel becomes smaller due to contraction of the smooth muscle in the vessel’s wall, the vessel is said to be \_\_\_\_\_\_. When the lumen becomes larger due to the muscle relaxing, the vessel is said to be \_\_\_\_\_\_.

82) Veins, especially those of the limbs, include \_\_\_\_\_ to prevent blood from flowing backwards.

83) Varicose veins are veins that swell and distend visibly due to damage to their \_\_\_\_\_.

84) \_\_\_\_\_ are the tiniest blood vessels, through the walls of which gases and nutrients are

exchanged with tissues.

85) Blood enters the capillaries from \_\_\_\_\_\_\_ vessels and exits the capillaries into \_\_\_\_\_\_\_ vessels.

86) Which tunics that are present in arteries and veins are absent in capillaries? \_\_\_\_\_\_\_

87) Gases and some small molecules can pass directly through the cells of the capillary walls by \_\_\_\_\_, but larger molecules and WBCs must exit the capillary by \_\_\_\_\_\_.

92) What is the average adult resting heart rate? \_\_\_\_\_\_\_\_

93) \_\_\_\_\_ means “listening to the bodily sounds”, usually using a stethoscope.

94) The \_\_\_\_\_ division of the nervous system contains neurons whose function is to accelerate heart rate.

95) The \_\_\_\_\_ division of the nervous system contains neurons whose function is to decelerate heart rate.

97) Endurance training often results in an increase/decrease (circle one) of the resting cardiac rate.

98) The below-normal resting heart rate of athletes is called \_\_\_\_\_\_\_\_\_\_.

102) In athletic individuals, low resting heart rate is normal and it is caused by the greater \_\_\_\_\_ in an athlete's heart.

104) Stroke volume is the amount of blood pumped by each \_\_\_\_\_ per \_\_\_\_\_.

105) An average adult's stroke volume is \_\_\_\_\_.

106) The major factor influencing stroke volume is the \_\_\_\_\_. (Hint: It relates to a certain volume of blood).

107) If a person started to hemorrhage, their stroke volume would increase/decrease (circle one)

108) The stroke volume can be changed by the \_\_\_\_\_\_ of ventricular contraction.

109) Endurance training often results in an increase/decrease (circle one) in the stroke volume.

110) Cardiac output is the amount of blood pumped by \_\_\_\_\_ in one \_\_\_\_\_.

111) The formula relating cardiac output, stroke volume and heart rate is \_\_\_\_\_. (Note: be able

to use it!)

112) A person has a stroke volume of 100 ml per beat and a heart rate of 60 beats per minute. What is their cardiac output?\_\_\_\_\_. (For full credit, include the proper units of cardiac output, not just the number).

113) For each factor, state whether it increases or decreases the heart rate:

 a) Being older \_\_\_\_\_\_\_\_

 b) Epinephrine \_\_\_\_\_\_\_\_

 c) The parasympathetic nervous system \_\_\_\_\_\_\_\_

 d) These study problems \_\_\_\_\_\_\_\_

e) Low stroke volume

 f) Being female

 g) Aerobic exercise (when exercising) \_\_\_\_\_\_\_\_\_

 h) Regular aerobic exercise (when not exercising)

114) When you exercise, the contractions of your voluntary muscles pump more blood back to your heart. This is called the \_\_\_\_\_\_\_ and it increases the \_\_\_\_\_\_\_\_\_ (a term meaning the blood that returns to the heart each beat). This will increase/decrease (circle one) the stroke volume.

115) A person has a stroke volume of 100 ml per beat and a resting heart rate of 50 beats per minute.

 a) This person is athletic/out of shape (circle one)

 b) What is their cardiac output? \_\_\_\_\_\_\_\_\_\_

116) If a person started to hemorrhage, their body would increase/decrease/maintain (circle one of the three) their heart rate in an attempt to increase/decrease/maintain (circle one of the three) their cardiac output.

11**7**) What are the units of blood pressure? \_\_\_\_\_. What is an average blood pressure reading? \_\_\_\_\_

118) Blood pressure readings always contain two numbers. The higher is called the \_\_\_\_\_\_ pressure and the lower is called the \_\_\_\_\_\_ pressure.

119) The blood pressure during the contraction of the ventricles is the \_\_\_\_\_ pressure, and is

normally \_\_\_\_\_ in a healthy adult.

120) The blood pressure during the relaxation of the ventricles is the \_\_\_\_\_ pressure, and is

normally \_\_\_\_\_ in a healthy adult.

121) Blood pressure is always measured in \_\_\_\_\_ (One of the three types of blood vessels).

122) The blood pressure in the systemic loop is higher/lower (circle one) at the end of the loop compared to the beginning.

123) When the ventricles contract, \_\_\_\_\_\_\_ mmHg of blood pressure is generated. The purpose of this pressure is to eject blood out of the heart.

129) The blood pressure is set by (is controlled by) the \_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_

130) The resistance to blood flow by the blood vessels is called the \_\_\_\_\_\_\_.

131) The two things that can change the peripheral resistance are \_\_\_\_\_ and \_\_\_\_\_.

132) As blood volume increases, peripheral resistance increases/decreases (circle one).

133) Blood loss causes blood pressure to increase/decrease (circle one).

134) For each pair of terms below, circle the term in that has higher blood pressure or that results in higher blood pressure.

 a) Systole/diastole

 b) Capillary/Arteriole

 c) Large lumen size/small lumen size

d) High blood volume/Low blood volume

e) Relaxation/Stress

f) Low salt diet/High salt diet

g) Vein/Artery

h) Sympathetic/Parasympathetic nervous systems

135) Two of the factors that affect blood pressure are blood volume and lumen size.

 a) If blood volume increases, blood pressure will increase/decrease (circle one)

b) If lumen size increases, blood pressure will increase/decrease (circle one)

c) Eating a diet that is high in sodium will increase your blood pressure. The sodium increases blood pressure by changing lumen size/blood volume (circle one).

d) Eating a diet that is high in fat will increase your blood pressure. The fat increases blood pressure by changing the lumen size/blood volume (circle one).

136) The larger/smaller (circle one) the blood vessel diameter, the higher the peripheral resistance.

 (Note: be able to use this concept and be able to interpret the answer as to whether blood pressure went up or down.)

137) The sympathetic nervous system can raise blood pressure by causing \_\_\_\_\_\_\_ of blood vessels.

138) The \_\_\_\_\_ (a pair of organs) are the major organs that adjust blood pressure.

139) The kidneys can increase blood pressure by adding \_\_\_\_\_ to the blood, which increases blood volume through osmosis.

140) Another way the kidneys can increase blood pressure is by activation of the powerful vasoconstrictor blood protein \_\_\_\_\_.

141) Sodium in the diet increases your blood pressure by increasing the blood volume. Sodium increases the blood volume by drawing water from the tissues into the blood using the process of \_\_\_\_\_\_\_.

142) Excess fat in the diet increases your blood pressure because it increases \_\_\_\_\_\_\_.

143) \_\_\_\_\_ is the clogging of blood vessels (especially coronary arteries) by fatty deposits.

144) \_\_\_\_\_ is chronically increased by atherosclerosis because fatty deposits called \_\_\_\_\_ make the lumen smaller, which increases \_\_\_\_\_\_.

145) Eating foods with high levels of \_\_\_\_\_\_\_ (a lipid molecule) is a major cause of atherosclerosis.

146) Although aging does lead to changes in the heart, the general consensus is that \_\_\_\_\_

and \_\_\_\_\_ (two unhealthy lifestyle choices), not aging, are usually the main causes of cardiovascular disease.

147) Long-term high blood pressure (called \_\_\_\_\_) damages the heart and, in untreated, eventually can cause congestive heart failure.

148) Blood pressure is in the 'hypertensive' range when it is \_\_\_\_\_ or greater. (Give the exact blood pressure numbers).

149) \_\_\_\_\_ refers to a condition in which the heart is weak. Its pumping efficiency is sufficient to keep the person alive but inadequate to keep them in good health.

150) In a person with congestive heart failure, fluid will accumulate in the \_\_\_\_\_\_\_ and in the \_\_\_\_\_\_\_

(two regions of the body).

151) Fluids build up in the lungs of congestive hart failure victims. This is because the left/right (circle one) ventricle tends to weaken more than the other ventricle, so blood pools in the pulmonary loop.

152) A blood clot in an unbroken blood vessel is called a(n) \_\_\_\_\_\_\_.

153) A heart attack is caused by sudden blockage of the \_\_\_\_\_\_ arteries.

154) In males, unexplained pain in the left arm should be treated seriously because it may be \_\_\_\_\_.

155) A heart attack is also called a \_\_\_\_\_\_\_ or a \_\_\_\_\_\_\_.

156) The \_\_\_\_\_ arteries deliver oxygen-rich blood to the muscles of the heart itself.

157) During a myocardial infarction, chest pain called \_\_\_\_\_\_\_ is often also felt as pain in the \_\_\_\_\_\_\_.

158) If a person has coronary artery disease, doctors can insert an inflatable balloon-like device into the clogged artery to push aside the blockage. This procedure is called \_\_\_\_\_\_\_.

159) Atherosclerosis (clogging of the arteries with fat) can lead to two disorders that cause the heart to not work correctly: A heart attack and congestive heart failure. These two disorders, however, are very different in terms of what goes wrong in the heart and what their symptoms are. After each description below, write and H if it matches a heart attack and write C if it matches congestive heart failure. Some blanks may require both answers.

 a) It comes on suddenly: \_\_\_\_\_\_\_

 b) Angina pectoris is a symptom: \_\_\_\_\_\_\_

 c) The blood does not circulate as well as is needed by the body: \_\_\_\_\_\_

 d) Fatigue and swollen legs are common symptoms: \_\_\_\_\_\_\_

 e) It is caused by the heart slowly wearing itself out over many years: \_\_\_\_\_\_\_

 f) It is caused by a blood vessel in the heart becoming suddenly blocked: \_\_\_\_\_\_\_

 g) A person with a low fat but high salt diet would be at risk for it: \_\_\_\_\_\_\_

161) The term \_\_\_\_\_ refers a condition of hypoperfusion (inadequate blood flow) because of low blood volume.

162) One major cause of shock is loss of \_\_\_\_\_\_ from the body.

163) The rapid fall in blood volume and pressure that occurs as a result of a severe allergic reaction (such as to bee stings, penicillin, or peanuts) is called \_\_\_\_\_\_\_ shock.

164) Anaphylactic shock occurs because certain immune cells release the molecule \_\_\_\_\_\_, which causes excessive vasodilation and leaky blood vessels.

**Answer to fill-in-the-blank review questions:**

1) Pulmonary loop

 Systemic loop

2) P

 P

 P

 PS

 S

 PS

3) Artery

4) Vein

5) Pulmonary

 Pulmonary

6) Atria

7) Ventricles

8) Atrium

9) Vena cava

12) a) T

 b) F

 c) T

 d) T

 e) T

13) a) LV

 b) RV, LV

 c) RA, LA

 d) RV, LV

 e) RA, LA, RV, LV

 f) LA, LV

 g) RA, RV

14) 1

 5

 2

 6

 3

 4

 7

15) Left atrium \_\_\_\_

Left ventricle \_\_\_\_

Pulmonary vein \_\_\_\_

 Aorta \_\_\_\_ Left AV valve \_\_\_\_

Aortic semi-lunar valve \_\_\_\_

16) Pulmonary artery

 Aorta

17) Left

18) Ventricles

19) Right ventricle

 Left ventricle

20) Left

 Right

21) Systemic

 Pulmonary

22) Higher

23) Atrioventricular (AV)

24) Semi-lunar

25) Dense connective tissue

26) True

28) AV values

 Contract

29) Semi-lunar

 Relax

38) Left atrium

40) Systole

 Diastole

41) AV valves

 Semilunar

42) Diastole

43) Diastole

 Diastole

44) c

45) a, b, d, e, g

46) a, b, d, e, g

47) c, f, g

48) a, d

49) a, c

52) Open

53) AV valve

54) Semilunar valve

55) Conducting tissue

56) SA (sino-atrial) node

 Right atrium

 Pacemaker

57) AV (atrio-ventricular)

58) Right atrium

59) Ca2+

60) Fibrillations

69) Lumen

70) Tunica interna

 Simple squamous

71) Tunica media

 Smooth muscle tissue

72) Tunica externa

 Protect the blood vessel

73) Dense connective tissue

74) Arteries

 Veins

75) a) Tunica externa, Dense connective tissue

 b) Tunica media, Smooth muscle tissue

 c) Tunica interna, Simple squamous epithelial

76) Vein

77) Pump

78) Arteries

 Arterioles

 Dilation

79) Arterioles

80) Venules

81) Contracted

 Dilated

82) One-way valves

83) One-way valves

84) Capillaries

85) Arteriole

 Venule

86) Tunica externa

 Tunica media

87) Diffusion

 Gaps in capillary wall

92) 72 beats per minute (bpm)

93) Auscultation

94) Sympathetic

95) Parasympathetic

97) Decrease

98) Athlete’s Bradycardia

102) Stroke volume

104) Ventricle

 Beat

105) 70 ml/beat

106) End diastolic volume

107) Decrease

108) Strength

109) Increase

110) Heart

 Minute

111) CO = SV x HR

112) 6000 ml/minute

113) Decrease

 Increase

 Decrease

 Increase (if they frighten you!)

 Increase

 Increase

 Increase

 Decrease

114) Skeletal muscle pump

 End diastolic volume

 Increase

115) Athlete

 5000 ml/minute

116) Increase

 Maintain

117) mmHg (millimeters of mercury)

 120/80 mmHg

118) Systolic

 Diastolic

119) Systolic

 120 mmHg

120) Diastolic

 80 mmHg

121) Arteries

122) Lower

123) 120

129) Cardiac output

 Peripheral resistance

130) Peripheral resistance

131) Blood volume

 Lumen size

132) Increases

133) Decrease

134) Systole

 Arteriole

 Large lumen size

 High blood volume

 Stress

 High salt diet

 Artery

 Sympathetic nervous system

135) Increase

 Blood volume

 Lumen size

136) Smaller

137) Contraction

138) Kidneys

139) Sodium

140) Angiotensin II

141) Osmosis

142) Peripheral resistance

143) Atherosclerosis

144) Blood pressure

 Plaques

 Peripheral resistance

145) Cholesterol

146) High fat diet

 Smoking

147) Chronic hypertension

148) 140/90 mmHg

149) Congestive heart failure

150) Lungs

 Legs

151) Left ventricle

152) Thrombus

153) Coronary

154) Heart attack

155) Myocardial infarction

 Coronary

156) Coronary

157) Angina pectoris

 Left arm or left shoulder

158) Angioplasty

159) a) H

 b) H

 c) HC

 d) C

 e) C

 f) H

 g) C

161) Shock

162) Blood

163) Anaphylactic shock

164) Histamine

**Short answer review questions:**

1) Blood is sometimes blue and sometimes red. What is it that determines whether the blood is red or blue?

2) The SA node in the heart sends signals to contract the atria. The AV node receives the contraction signal from the SA node, delays a moment, then sends the signal to contract the ventricles. Explain why the AV node delays before sending the contraction signal to the ventricles.

3) Arteries have a thick tissue layer in their wall called the tunica media. What type of tissue is the tunica media and is its main function?

4) Although the heart is the major pump that circulates the blood, there is a second system that the body uses to help push blood in veins back to the heart. Describe this system (a diagram may be helpful) and state why it could not function in arteries and capillaries.

5) Capillaries deliver oxygen to the cells of the tissues. However, the oxygen in the capillary does not go directly from the capillary to the cells of the tissue. What substance does the oxygen pass through between the capillary and the cell, and where does this substance come from?

6) CO2 and antibodies (a type of large protein molecule in the blood) can both move between the blood in the capillaries and the fluids of the tissues. But each molecule uses a different method of passing through the capillary wall. For each molecule, state how it passes through the capillary wall and also state why you believe that is its method of passage.

7) Unlike skeletal muscle, cardiac muscle does not get its contractions signals from neurons. Nevertheless, there are motor neurons that synapse with the heart (mostly in the right atrium). What are the names of these motor neurons and what is their function?

8) Blood pressure is always given as two numbers. Explain what makes the first number higher than the second.

9) The sympathetic nervous system can increase blood pressure in several ways, including increasing cardiac output. Describe in detail one way that the sympathetic division increases blood pressure that does **not** involve the heart.

10) Explain at a molecular level how sodium in the diet increases your blood pressure.

11) Explain at a blood vessel level how the fat in the diet increases your blood pressure.

12) Explain all the ways the kidneys counteract low blood pressure. Your explanations should include exactly what the kidneys add to the blood and how this raises the blood pressure.

13) To treat shock, doctors sometimes inject “plasma expanders” into the patient. Plasma expanders are large solutes (such as starch or proteins) that are too large to exit the blood vessels. Explain at a molecular level how plasma expanders treat shock.

**Answers to short answer review questions:**

1) The amount of oxygen determines blood color. Blood that is high in oxygen is red, whereas blood that is low in oxygen is blue.

2) The AV node delays the contraction signal to give time for the atria to fill the ventricles with blood.

3) The tunica media is smooth muscle. Its main purpose is to act like a valve for the blood vessel. If the body wants less blood flow to an organ, the smooth muscle of that organ’s arteries constricts, reducing the lumen size (and therefore decreasing the blood flow). If the body wants more blood flow to an organ, the smooth muscle of that organ’s arteries relaxes, increasing the lumen size (and therefore increasing the blood flow).

4) The second “pump” of the blood is the skeletal muscles pump. Whenever we use our skeletal muscles, they squeeze on the veins inside the muscles. This propels the blood in the veins in only one direction: Back toward the heart. This is because veins have one-way valves that point toward the heart. Capillaries and arteries lack valves and therefore cannot be used by the skeletal muscle pump.

5) The oxygen (and all other molecules that the capillaries supply to the cells) first enters the tissue fluid before it enters the cells themselves. The tissue fluid is a watery liquid that surrounds all the cells of the body. All materials that exit the capillaries first dissolve into the tissue fluid. The tissue fluid comes from the plasma (the watery part of the blood) that has leaked through tiny openings in the capillary wall.

6) The CO2 diffuses through the cells that make up the capillary wall, whereas antibodies pass through small gaps between the cells of the capillary wall. The size of the molecules explains the difference: Small molecules (especially non-polar ones like CO2) can pass easily through a cell membrane. Large molecules (like antibodies and other proteins) are much to large to diffuse through a cell membrane, and must instead use the gaps in the capillary wall to exit the blood vessel.

7) The motor neurons that synapse with the heart are the motor neurons of the sympathetic and the parasympathetic divisions of the nervous system. Although they do not directly cause the heart muscle cells to contract, they do affect the rate that the SA node (the heart’s pacemaker, located in the right atrium) sends contraction and relaxation signals to the heart.

8) The first and higher blood pressure number is called the systolic pressure. It is the blood pressure when the heart is contracting on the blood. The second and lower blood pressure number is called the diastolic pressure. It is the blood pressure when the heart is relaxing. The systolic pressure is always higher because the pressure of any liquid is increased by squeezing the liquid, and that is what happens when the heart contracts during systole.

9) The sympathetic nervous system can increase blood pressure by causing contraction of the tunica media (smooth muscle layer) of many arteries. This decreases the lumen size of the blood vessel, which increases peripheral resistance, which increases blood pressure.

10) Sodium in the diet causes high sodium levels in the blood. The high sodium draws water by osmosis into the blood from surrounding tissues. This increases the blood volume, which increases peripheral resistance, which increases blood pressure.

11) Fat in the diet causes plaques (fatty deposits in the blood vessels). Since the plaques partially block the blood vessel, they effectively make the lumen smaller. Smaller lumen size increases peripheral resistance, which increases blood pressure.

12) When the blood pressure is low, the kidneys can add sodium to the blood. The sodium increases blood volume by adding water to the blood via osmosis. The kidneys can also increase blood pressure by adding the protein rennin to the blood. Renin leads to the activation of a protein called angiotensin II. The angiotensin II increases blood pressure by causing vasoconstriction (a decrease of the lumen size of blood vessels, which increases blood pressure by increasing peripheral resistance) and also by causing the adrenal gland to release the hormone aldosterone, which causes the kidneys to add sodium to the blood.

13) Shock is hypoperfusion due to low blood volume. Plasma expanders counteract shock by increasing blood volume. The solutes of plasma expanders (such as starch and proteins) are too large to exit the blood vessel. These solutes therefore increase the solute concentration of the blood and thereby draw water into the blood by osmosis.