

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) Ca^{2+} .
- 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 | 9 = C | 18 = D |
| 2 = C | 10 = D | 19 = B |
| 3 = D | 11 = A | 20 = A |
| 4 = C | 12 = D | 21 = B |
| 5 = D | 13 = C | 22 = D |
| 6 = D | 14 = A | 23 = C |
| 7 = B | 15 = B | 24 = D |
| 8 = B | 16 = C | 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(ue) 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?).

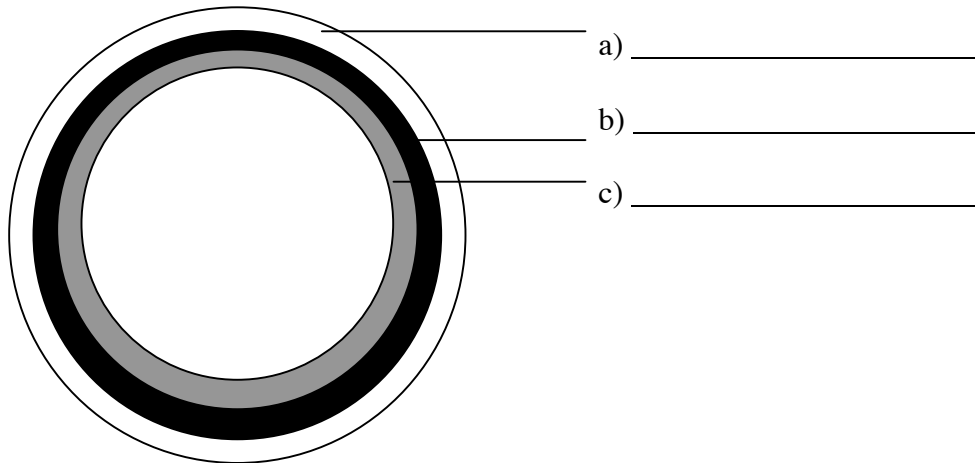
71) _____ is the middle tunic of blood vessels, and primarily consists of _____ tissue.

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.



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.

117) 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 heart 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 valves
 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) $CO = SV \times HR$
- 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 too 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.