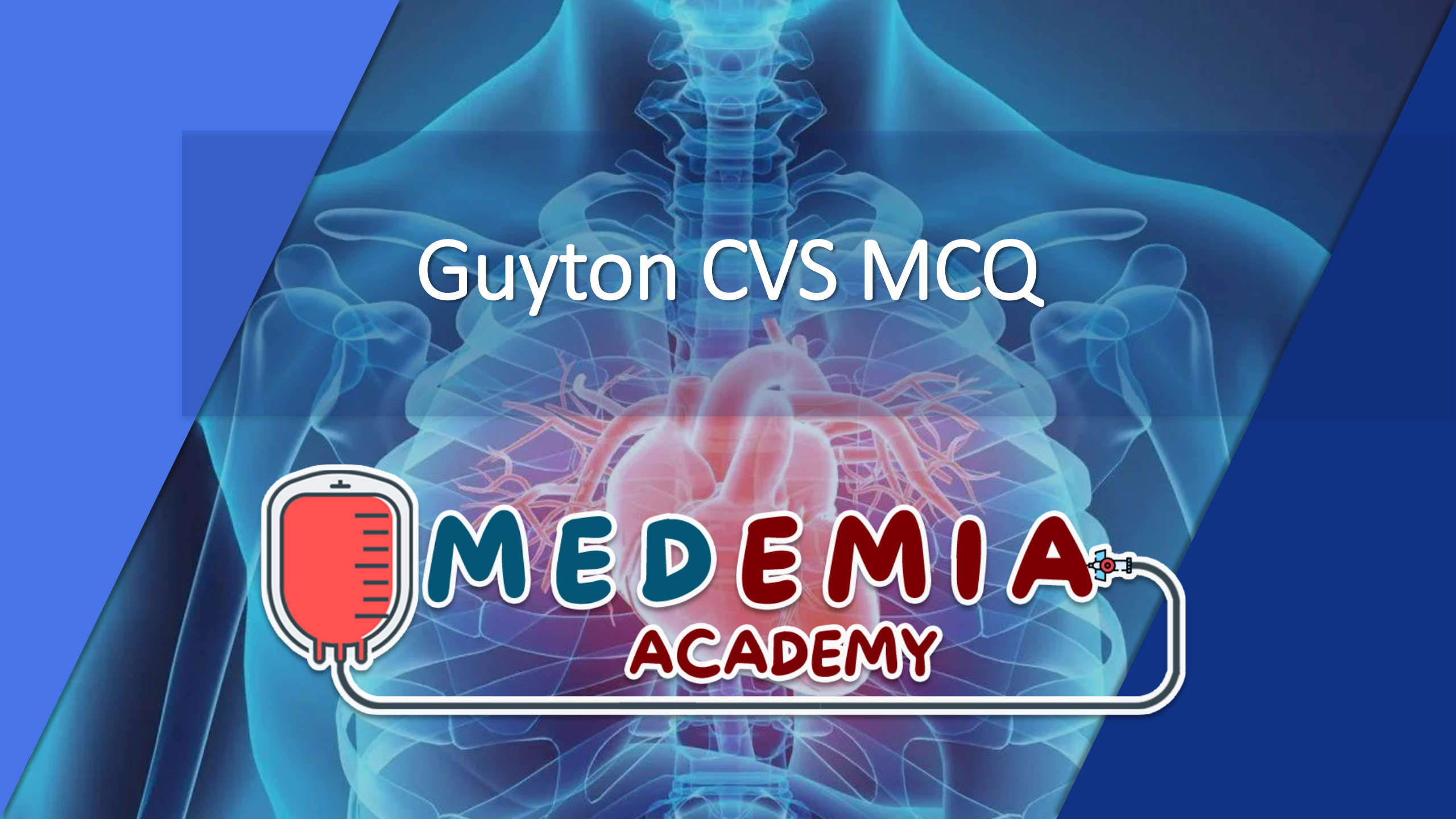
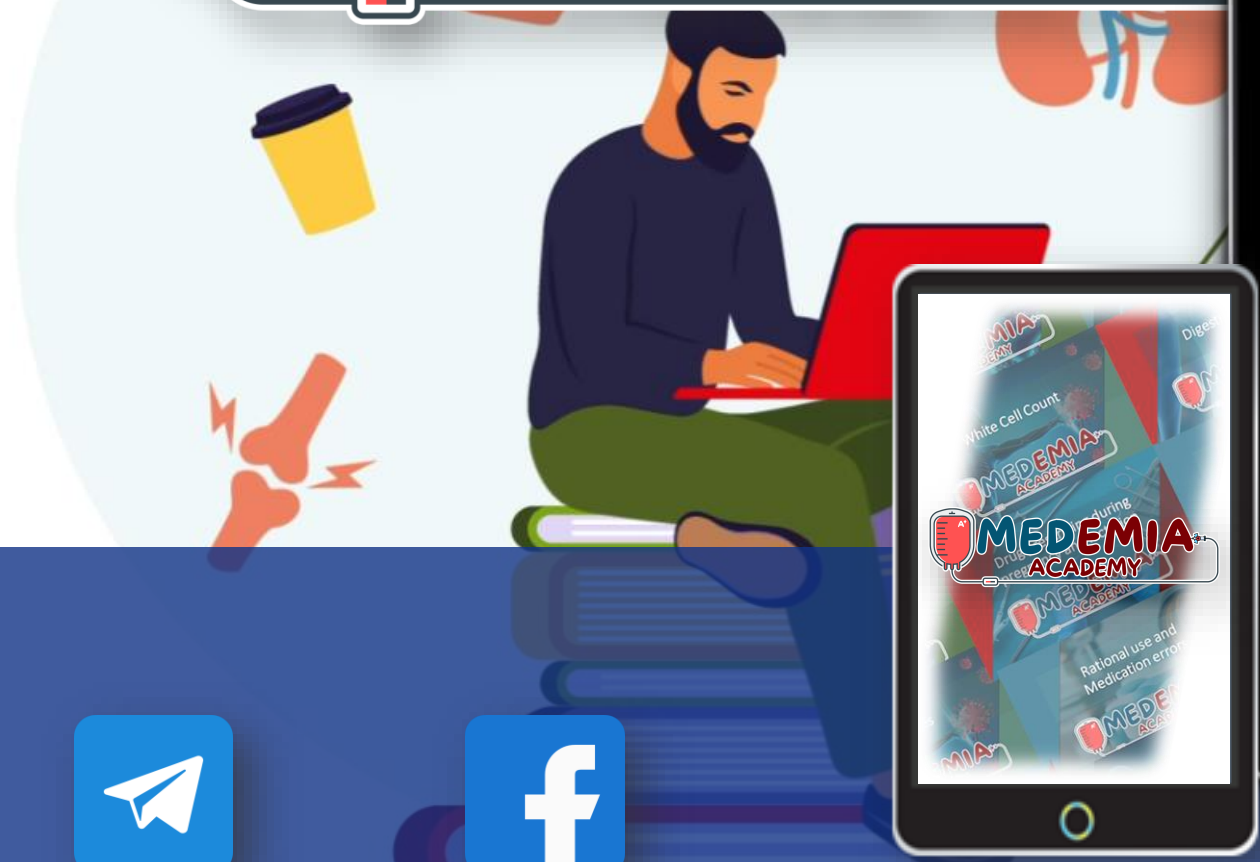
Guyton CVS MCQ



MEDEMIA ACADEMY



Color code

Red: Important information

Blue: Explanations & Dr. notes

Green: Additional information

Purple: Mnemonics

MCQ

1. Which statement about cardiac muscle is most accurate?

A) The T-tubules of cardiac muscle can store much less calcium than the T-tubules in skeletal muscle

B) The strength and contraction of cardiac muscle depends on the amount of calcium surrounding cardiac myocytes

C) In cardiac muscle, the initiation of the action potential causes an immediate opening of slow calcium channels

D) Cardiac muscle repolarization is caused by opening of sodium channels

E) Mucopolysaccharides inside the T-tubules bind chloride ions

MEDEMIA ACADEMY

MCQ

2. A 30-year-old man has an ejection fraction of 0.25 and an end-systolic volume of 150 milliliters. What is his end-diastolic volume?

A) 50 milliliters

B) 100 milliliters

C) 125 milliliters

D) 200 milliliters

E) 250 milliliters

MEDEMIA ACADEMY

MCQ

3. In a resting adult, the typical ventricular ejection fraction has what value?

A) 20%

B) 30%

C) 40%

D) 60%

E) 80%

MEDEMIA ACADEMY

MCQ

4. In which phase of the ventricular muscle action potential is the potassium permeability the highest?

A) 0

B) 1

C) 2

D) 3

E) 4

MEDEMIA ACADEMY

MCQ

5. A 60-year-old man’s ECG shows that he has an R-R interval of 1.5 seconds at rest. Which statement best explains his condition?

A) He has fever

B) He has a normal heart rate

C) He has decreased parasympathetic stimulation of

the S-A node

D) He is a trained athlete at rest

E) He has normal polarization of the S-A node

MEDEMIA ACADEMY

MCQ

6. Which of the following is most likely to cause the heart to go into spastic contraction?

A) Increased body temperature

B) Increased sympathetic activity

C) Decreased extracellular fluid potassium ions

D) Excess extracellular fluid potassium ions

E) Excess extracellular fluid calcium ions

MEDEMIA ACADEMY

MCQ

7. What happens at the end of ventricular isovolumic relaxation?

A) The A-V valves close

B) The aortic valve opens

C) The aortic valve closes

D) The mitral valve opens

E) The pulmonary valve closes

MEDEMIA ACADEMY

MCQ

8. Which event is associated with the first heart sound?

A) Closing of the aortic valve

B) Inrushing of blood into the ventricles during diastole

C) Beginning of diastole

D) Opening of the A-V valves

E) Closing of the A-V valves

MEDEMIA ACADEMY

MCQ

9. Which condition will result in a dilated, flaccid heart?

A) Excess calcium ions in the blood

B) Excess potassium ions in the blood

C) Excess sodium ions in the blood

D) Increased sympathetic stimulation

E) Increased norepinephrine concentration in the blood

MEDEMIA ACADEMY

MCQ

10. Which phase of the cardiac cycle follows immediately after the beginning of the QRS wave?

A) Isovolumic relaxation

B) Ventricular ejection

C) Atrial systole

D) Diastasis

E) Isovolumic contraction

MEDEMIA ACADEMY

MCQ

11. Which of the following structures will have the slowest rate of conduction of the cardiac action potential?

A) Atrial muscle

B) Anterior internodal pathway

C) A-V bundle fibers

D) Purkinje fibers

E) Ventricular muscle

MEDEMIA ACADEMY

MCQ

12. Sympathetic stimulation of the heart does which of the following?

A) Releases acetylcholine at the sympathetic endings

B) Decreases sinus nodal discharge rate

C) Decreases excitability of the heart

D) Releases norepinephrine at the sympathetic endings

E) Decreases cardiac contractility

MEDEMIA ACADEMY

MCQ

13. Which condition at the A-V node will cause a decrease in heart rate?

A) Increased sodium permeability

B) Decreased acetylcholine levels

C) Increased norepinephrine levels

D) Increased potassium permeability

E) Increased calcium permeability

MEDEMIA ACADEMY

14. Which statement best explains how sympathetic stimulation affects the heart?

A) The permeability of the S-A node to sodium decreases

B) The permeability of the A-V node to sodium decreases

C) The permeability of the S-A node to potassium increases

D) There is an increased rate of upward drift of the resting membrane potential of the S-A node

E) The permeability of the cardiac muscle to calcium

decreases

MEDEMIA ACADEMY

15. What is the membrane potential (threshold level) at which the S-A node discharges?

A) −40 millivolt

B) −55 millivolt

C) −65 millivolt

D) −85 millivolt

E) −105 millivolt

MEDEMIA ACADEMY

MCQ

16. Which condition at the S-A node will cause heart rate to decrease?

A) Increased norepinephrine level

B) Increased sodium permeability

C) Increased calcium permeability

D) Increased potassium permeability

E) Decreased acetylcholine level

MEDEMIA ACADEMY

MCQ

17. In which phase of the ventricular muscle action potential is the sodium permeability the highest?

A) 0

B) 1

C) 2

D) 3

E) 4

MEDEMIA ACADEMY

MCQ

18. Which condition at the A-V node will cause a decrease in heart rate?

A) Increased sodium permeability

B) Decreased acetylcholine level

C) Increased norepinephrine level

D) Increased potassium permeability

E) Increased calcium permeability

MEDEMIA ACADEMY

MCQ

19. Sympathetic stimulation of the heart normally causes which condition?

A) Acetylcholine release at the sympathetic endings

B) Decreased heart rate

C) Decreased rate of conduction of the cardiac impulse

D) Decreased force of contraction of the atria

E) Increased force of contraction of the ventricles

MEDEMIA ACADEMY

MCQ

20. Which vasoactive agent is usually the most important controller of coronary blood flow?

A) Adenosine

B) Bradykinin

C) Prostaglandins

D) Carbon dioxide

E) Potassium ions

MEDEMIA ACADEMY

MCQ

21. Which statement about coronary blood flow is most accurate?

A) Normal resting coronary blood flow is 500 ml/min

B) The majority of flow occurs during systole

C) During systole, the percentage decrease in subendocardial flow is greater than the percentage decrease in epicardial flow

D) Adenosine release will normally decrease coronary

flow

MEDEMIA ACADEMY

MCQ

22. An increase in shear stress in a blood vessel results in which change?

A) Decreased endothelin production

B) Decreased cyclic guanosine monophosphate production

C) Increased nitric oxide release

D) Increased renin production

E) Decreased prostacyclin production

MEDEMIA ACADEMY

MCQ

23. The diameter of a precapillary arteriole is increased in a muscle vascular bed. A decrease in which of the following would be expected?

A) Capillary filtration rate

B) Vascular conductance

C) Capillary blood flow

D) Capillary hydrostatic pressure

E) Arteriolar resistance

MEDEMIA ACADEMY

MCQ

24. Which mechanism would tend to decrease capillary filtration rate?

A) Increased capillary hydrostatic pressure

B) Decreased plasma colloid osmotic pressure

C) Increased interstitial colloid osmotic pressure

D) Decreased capillary water permeability

E) Decreased arteriolar resistance

MEDEMIA ACADEMY

MCQ

25. The diameter of a precapillary arteriole is decreased in a muscle vascular bed. Which change in the microcirculation would be expected?

A) Decreased capillary filtration rate

B) Increased interstitial volume

C) Increased lymph flow

D) Increased capillary hydrostatic pressure

E) Decreased arteriolar resistance

MEDEMIA ACADEMY

MCQ

26. An increase in which of the following would tend to increase lymph flow?

A) Hydraulic conductivity of the capillary wall

B) Plasma colloid osmotic pressure

C) Capillary hydrostatic pressure

D) Arteriolar resistance

E) A and C

MEDEMIA ACADEMY

MCQ

27. An increase in which of the following would be expected to decrease blood flow in a vessel?

A) Pressure gradient across the vessel

B) Radius of the vessel

C) Plasma colloid osmotic pressure

D) Viscosity of the blood

E) Plasma sodium concentration

MEDEMIA ACADEMY

MCQ

28. Under normal physiological conditions, blood flow to the skeletal muscles is determined mainly by which of the following?

A) Sympathetic nerves

B) Angiotensin II

C) Vasopressin

D) Metabolic needs

E) Capillary osmotic pressure

MEDEMIA ACADEMY

MCQ

29. A healthy 22-year-old female medical student has an exercise stress test at a local health club. An increase in which of the following is most likely to occur in this woman's skeletal muscles during exercise?

A) Vascular conductance

B) Blood flow

C) Carbon dioxide concentration

D) Arteriolar diameter

E) All the above

MEDEMIA ACADEMY

MCQ

30. Which of the following segments of the circulatory system has the highest velocity of blood flow?

A) Aorta

B) Arteries

C) Capillaries

D) Venules

E) Veins

MEDEMIA ACADEMY

MCQ

31. Which of the following vessels has the greatest total cross-sectional area in the circulatory system?

A) Aorta

B) Small arteries

C) Capillaries

D) Venules

E) Vena cava

MEDEMIA ACADEMY

MCQ

32. An increase in atrial pressure results in which of the following?

A) Decrease in plasma atrial natriuretic peptide

B) Increase in plasma angiotensin II concentration

C) Increase in plasma aldosterone concentration

D) Increase in sodium excretion

MEDEMIA ACADEMY

MCQ

33. Autoregulation of tissue blood flow in response to an increase in arterial pressure occurs as a result of which of the following?

A) Decrease in vascular resistance

B) Initial decrease in vascular wall tension

C) Excess delivery of nutrients such as oxygen to the tissues

D) Decrease in tissue metabolism

MEDEMIA ACADEMY

MCQ

34. Which component of the circulatory system contains the largest percentage of the total blood volume?

A) Arteries

B) Capillaries

C) Veins

D) Pulmonary circulation

E) Heart

MEDEMIA ACADEMY

MCQ

35. An increase in which of the following tends to decrease capillary filtration rate?

A) Capillary hydrostatic pressure

B) Plasma colloid osmotic pressure

C) Interstitial colloid osmotic pressure

D) Venous hydrostatic pressure

E) Arteriolar diameter

MEDEMIA ACADEMY

MCQ

36. A decrease in the production of which of the following would most likely result in chronic hypertension?

A) Aldosterone

B) Thromboxane

C) Angiotensin II

D) Nitric oxide

MEDEMIA ACADEMY

MCQ

37. Which of the following would be expected to occur during a Cushing reaction caused by brain ischemia?

A) Increase in parasympathetic activity

B) Decrease in arterial pressure

C) Decrease in heart rate

D) Increase in sympathetic activity

MEDEMIA ACADEMY

MCQ

38. Which part of the circulation has the highest compliance?

A) Capillaries

B) Large arteries

C) Veins

D) Aorta

E) Small arteries

MEDEMIA ACADEMY

MCQ

39. A decrease in which of the following tends to increase pulse pressure?

A) Systolic pressure

B) Stroke volume

C) Arterial compliance

D) Venous return

E) Plasma volume

MEDEMIA ACADEMY

MCQ

40. Blood flow to a tissue remains relatively constant despite a reduction in arterial pressure (autoregulation). Which of the following would be expected to occur in response to the reduction in arterial pressure?

A) Decreased conductance

B) Decreased tissue carbon dioxide concentration

C) Increased tissue oxygen concentration

D) Decreased vascular resistance

E) Decreased arteriolar diameter

MEDEMIA ACADEMY

MCQ

41. An increase in which of the following tends to increase capillary filtration rate?

A) Capillary wall hydraulic conductivity

B) Arteriolar resistance

C) Plasma colloid osmotic pressure

D) Interstitial hydrostatic pressure

E) Plasma sodium concentration

MEDEMIA ACADEMY

MCQ

42. The tendency for turbulent flow is greatest in which of the following?

A) Arterioles

B) Capillaries

C) Small arterioles

D) Aorta

MEDEMIA ACADEMY

MCQ

43. What would tend to increase a person's pulse pressure?

A) Decreased stroke volume

B) Increased arterial compliance

C) Hemorrhage

D) Patent ductus

E) Decreased venous return

MEDEMIA ACADEMY

MCQ

44. What would decrease venous hydrostatic pressure in the legs?

A) Increase in right atrial pressure

B) Pregnancy

C) Movement of leg muscles

D) Presence of ascitic fluid in the abdomen

MEDEMIA ACADEMY

MCQ

45. Which condition often occurs in progressive hemorrhagic shock?

A) Vasomotor center failure

B) Increased urine output

C) Tissue alkalosis

D) Decreased capillary permeability

E) Increased mean systemic filling pressure

MEDEMIA ACADEMY

MCQ

46. What is normally associated with an increased cardiac output?

A) Increased venous compliance

B) Cardiac tamponade

C) Surgically opening the chest

D) Moderate anemia

E) Severe aortic stenosis

MEDEMIA ACADEMY

MCQ

47. In which condition would you normally expect to find a decreased cardiac output?

A) Hyperthyroidism

B) Beriberi

C) A-V fistula

D) Anemia

E) Acute myocardial infarction

MEDEMIA ACADEMY

MCQ

48. At the onset of exercise, what normally occurs?

A) Decreased cerebral blood flow

B) Increased venous constriction

C) Decreased coronary blood flow

D) Decreased mean systemic filling pressure

E) Increased parasympathetic impulses to the heart

MEDEMIA ACADEMY

MCQ

49. What is the most frequent cause of decreased coronary blood flow in patients with ischemic heart disease?

A) Increased adenosine release

B) Atherosclerosis

C) Coronary artery spasm

D) Increased sympathetic tone of the coronary arteries

E) Occlusion of the coronary sinus

MEDEMIA ACADEMY

MCQ

50 . What is one of the major causes of death after myocardial infarction?

A) Increased cardiac output

B) A decrease in pulmonary interstitial volume

C) Fibrillation of the heart

D) Increased cardiac contractility

MEDEMIA ACADEMY

MCQ

51. Which statement about the results of sympathetic stimulation is most accurate?

A) Epicardial flow increases

B) Venous resistance decreases

C) Arteriolar resistance decreases

D) Heart rate decreases

E) Venous reservoirs constrict

MEDEMIA ACADEMY

Answers

1. B) The cardiac muscle stores much more calcium in its tubular system than does skeletal muscle and is much more dependent on extracellular calcium than is the skeletal muscle. An abundance of calcium is bound by the mucopolysaccharides inside the T-tubule. This calcium is necessary for contraction of cardiac muscle, and its strength of contraction depends on the calcium concentration surrounding the cardiac myocytes. At the initiation of the action potential, the fast sodium channels open first, which is followed later by opening of the slow calcium channels.

MEDEMIA ACADEMY

Answers

2. D) The end-diastolic volume is always greater than the end-systolic volume. Multiplication of the ejection fraction by the end-diastolic volume provides the stroke volume, which is 50 milliliters in this problem. Therefore, the end-diastolic volume is 50 milliliters greater than the end-systolic volume and has a value of 200 milliliters.

MEDEMIA ACADEMY

Answers

3. D) The typical ejection fraction is 60%, and lower values are indicative of a weakened heart.

Answers

4. D) During phase 3 of the ventricular muscle action potential, the potassium permeability of ventricular muscle greatly increases, which causes a more negative membrane potential.

5. D) Heart rate is determined by the formula 60/R-R interval. The heart rate for this patient is 40 beats per minute. This heart rate is slow, which would occur in a trained athlete. A fever would increase heart rate. Excess parasympathetic stimulation and hyperpolarization of the S-A node both decrease heart rate.

MEDEMIA ACADEMY

Answers

6. E) The heart goes into spastic contraction after a large increase in the calcium ion concentration surrounding the cardiac myofibrils, which occurs if the extracellular fluid calcium ion concentration increases too much.
An excess potassium concentration in the extracellular fluids causes the heart to become dilated because of the decrease in resting membrane potential of the cardiac muscle fibers.

MEDEMIA ACADEMY

Answers

7. D) At the end of isovolumic relaxation, the mitral and tricuspid valves open, which is followed by the period of diastolic filling.

8. E) the first heart sound by definition occurs just after the ventricular pressure exceeds the atrial pressure, which causes the A-V valves to memhanically close. The second heart sound occurs when the aortic and pulmonary valves close.

MEDEMIA ACADEMY

Answers

9. B) Having excess potassium ions in the blood and extracellular fluid causes the heart to become dilated and flaccid and also slows the heart. This effect is important because of a decrease in the resting membrane potential in the cardiac muscle fibers. As the membrane potential decreases, the intensity of the action potential decreases, which makes the contraction of the heart progressively weaker. Excess calcium ions in the blood and sympathetic stimulation and increased norepinephrine concentration of the blood all cause the heart to contract vigorously.

MEDEMIA ACADEMY

Answers

10. E) Immediately after the QRS wave, the ventricles begin to contract, and the first phase that occurs is isovolumic contraction. Isovolumic contraction occurs before the ejection phase and increases the ventricular pressure enough to mechanically open the aortic and pulmonary valves.

MEDEMIA ACADEMY

Answers

11. C) The atrial and ventricular muscles have a relatively rapid rate of conduction of the cardiac action potential, and the anterior internodal pathway also has fairly rapid conduction of the impulse. However, the A-V bundle myofibrils have a slow rate of conduction because their sizes are considerably smaller than the sizes of the normal atrial and ventricular muscle. In addition, their slow conduction is partly caused by diminished numbers of gap junctions between successive muscle cells in the conducting pathway, causing a great resistance to conduction of the excitatory ions from one cell to the next.

MEDEMIA ACADEMY

Answers

12. D) Increased sympathetic stimulation of the heart increases heart rate, atrial contractility, and ventricular contractility and also increases norepinephrine release at the ventricular sympathetic nerve endings. It does not release acetylcholine. It does cause an increased sodium permeability of the A-V node, which increases the rate of upward drift of the membrane potential to the threshold level for self-excitation, thus increasing the heart rate.

MEDEMIA ACADEMY

Answers

13. D) The increase in potassium permeability causes a hyperpolarization of the A-V node, which will decrease the heart rate. Increases in sodium permeability will actually partially depolarize the A-V node, and an in-crease in norepinephrine levels increases the heart rate..

MEDEMIA ACADEMY

Answers

14. D) During sympathetic stimulation, the permeabilities of the S-A node and the A-V node increase. In addition, the permeability of cardiac muscle to calcium increases, resulting in an increased contractile strength. Furthermore, an upward drift of the resting membrane potential of the S-A node occurs. Increased permeability of the S-A node to potassium does not occur during sympathetic stimulation.

MEDEMIA ACADEMY

Answers

15. A) The normal resting membrane potential of the S-A node is −55 millivolts. As the sodium leaks into the membrane, an upward drift of the membrane potential occurs until it reaches −40 millivolts. This is the thresh-old level that initiates the action potential at the S-A node.

MEDEMIA ACADEMY

Answers

16. D) Increases in sodium and calcium permeability at the S-A node result in an increase in heart rate. An increased potassium permeability causes a hyperpolarization of the S-A node, which causes the heart rate to decrease.

MEDEMIA ACADEMY

Answers

17. A) Sodium permeability is highest during phase 0. Calcium permeability is highest during phase 2, and potassium is most permeable in phase 3.

MEDEMIA ACADEMY

Answers

18. D) An increase in potassium permeability causes a decrease in the membrane potential of the A-V node. Thus, it will be extremely hyperpolarized, making it much more difficult for the membrane potential to reach its threshold level for conduction, resulting in a decrease in heart rate. Increases in sodium and calcium permeability and norepinephrine levels increase the membrane potential, causing a tendency to increase the heart rate.

MEDEMIA ACADEMY

Answers

19. E) Sympathetic stimulation of the heart normally causes an increased heart rate, increased rate of conduction of the cardiac impulse, and increased force of contraction in the atria and ventricles. However, it does not cause acetylcholine release at the sympathetic endings because they contain norepinephrine. Parasympathetic stimulation causes acetylcholine release. The sympathetic nervous system firing increases in the permeability of the cardiac muscle fibers, the S-A node, and the A-V node to sodium and calcium.

MEDEMIA ACADEMY

Answers

20. A) Although bradykinin, prostaglandins, carbon dioxide, and potassium ions serve as vasodilators for the coronary artery system, the major controller of coronary blood flow is adenosine. Adenosine is formed as adenosine triphosphate degrades to adenosine monophosphate. Small portions of the adenosine monophosphate are then further degraded to release adenosine into the tissue fluids of the heart muscle, and this adenosine vasodilates the coronary arteries.

MEDEMIA ACADEMY

Answers

21. C) The normal resting coronary blood flow is approximately 225 ml/min. Infusion of adenosine or local release of adenosine normally increases the coronary blood flow. The contraction of the cardiac muscle around the vasculature, particularly in the subendocardial vessels, causes a decrease in blood flow. Therefore, during the systolic phase of the cardiac cycle, the subendocardial flow clearly decreases, while the decrease in epicardial flow is relatively minor.

MEDEMIA ACADEMY

Answers

22. C) An increase in shear stress in blood vessels is one of the major stimuli for the release of nitric oxide by endothelial cells. Nitric oxide increases blood flow by increasing cyclic guanosine monophosphate.

23. E) An increase in the diameter of a precapillary arteriole would decrease arteriolar resistance. The decrease in arteriolar resistance would lead to an increase in vascular conductance and capillary blood flow, hydrostatic pressure, and filtration rate.

MEDEMIA ACADEMY

Answers

24. D) Filtration rate is the product of the filtration coef-ficient (Kf) and the net pressure across the capillary wall. The net pressure for fluid movement across a capillary wall is promoted by increases in capillary hydrostatic pressure and positive interstitial colloid osmotic pressure, whereas negative plasma colloid osmotic pressure and a positive interstitial hydrostatic pressure oppose filtration. Thus, increased capillary hydrostatic pressure, decreased plasma colloid osmotic pressure, and increased interstitial colloid osmotic pressure would all promote filtration. Decreased arteriolar resistance would also promote filtration by increasing capillary hydrostatic pressure. The filtration coefficient is the product of capillary surface area and the capillary water permeability. A decrease in capillary water permeability would decrease the filtration coefficient and reduce the filtration rate.

MEDEMIA ACADEMY

Answers

25. A) A decrease in the diameter of a precapillary arteriole increases arteriolar resistance while decreasing vascular conductance and capillary blood flow, hydrostatic pressure, filtration rate, interstitial volume, And interstitial hydrostatic pressure.

MEDEMIA ACADEMY

Answers

26. E) The two main factors that increase lymph flow are an increase in capillary filtration rate and an increase in lymphatic pump activity. An increase in plasma colloid osmotic pressure decreases capillary filtration rate, interstitial volume and hydrostatic pressure, and lymph flow. In contrast, an increase in hydraulic conductivity of the capillary wall and capillary hydrostatic pressure increase capillary filtration rate, interstitial volume and pressure, and lymph flow. An increase in arteriole resistance would decrease capillary hydrostatic pressure, capillary filtration rate, interstitial volume and pressure, and lymph flow.

MEDEMIA ACADEMY

Answers

27. D) The rate of blood flow is directly proportional to the fourth power of the vessel radius and to the pressure gradient across the vessel. In contrast, the rate of blood flow is inversely proportional to the viscosity of the blood. Thus, an increase in blood viscosity would decrease blood flow in a vessel.

MEDEMIA ACADEMY

Answers

28. D) Although sympathetic nerves, angiotensin II, and vasopressin are powerful vasoconstrictors, blood flow to skeletal muscles under normal physiological conditions is mainly determined by local metabolic needs.
29. E) During exercise, tissue levels of carbon dioxide and lactic acid increase. These metabolites dilate blood vessels, decrease arteriolar resistance, and enhance vascular conductance and blood flow.
30. A) The velocity of blood flow within each segment of

31. the circulatory system is inversely proportional to the total cross-sectional area of the segment. Because the aorta has the smallest total cross-sectional area of all circulatory segments, it has the highest velocity of blood flow.

MEDEMIA ACADEMY

Answers

31. C) The capillaries have the largest total cross-sectional area of all vessels of the circulatory system. The venules also have a relatively large total cross-sectional area, but not as great as the capillaries, which explains the large storage of blood in the venous system compared with that in the arterial system.

32. D) An increase in atrial pressure would also increase plasma levels of atrial natriuretic peptide, which in turn would decrease plasma levels of angiotensin II and aldosterone and increase sodium excretion.

33. C) An increase in perfusion pressure to a tissue results in excessive delivery of nutrients such as oxygen to a tissue. The increase in tissue oxygen concentration constricts arterioles and returns blood flow and nutrient delivery toward normal levels.

MEDEMIA ACADEMY

Answers

34. C) The percentage of total blood volume in the veins is approximately 64%.

35. B) An increase in plasma colloid osmotic pressure would reduce net filtration pressure and capillary filtration rate. Increases in capillary hydrostatic pressure and interstitial colloid osmotic pressure would also favor capillary filtration. An increase in venous hydrostatic pressure and arteriolar diameter would tend to increase capillary hydrostatic pressure and capillary filtration rate.

MEDEMIA ACADEMY

Answers

36. D) Nitric oxide is a potent vasodilator and natri-uretic substance. Thus, a reduction in nitric oxide production would result in an increase in arterial pressure. In contrast, angiotensin II, thromboxane, and aldosterone are vasoconstrictor and/or antinatri-uretic factors. A decrease in the production of these factors would tend to decrease arterial pressure.

37. D) The Cushing reaction is a special type of CNS ischemic response that results from increased pressure of the cerebrospinal fluid around the brain in the cranial vault. When the cerebrospinal fluid pressure rises, it decreases the blood supply to the brain and elicits a CNS ischemic response. The CNS ischemic response includes enhanced sympathetic activity, decreased parasympathetic activity, and increased heart rate, arterial pressure, and total peripheral resistance.

MEDEMIA ACADEMY

Answers

38. C) The vascular compliance is proportional to the vascular distensibility and the vascular volume of any given segment of the circulation. The compliance of a systemic vein is 24 times that of its corresponding artery because it is about 8 times as distensible and has a volume about 3 times as great.

39. C) The difference between systolic pressure and diastolic pressure is called the pulse pressure. The two main factors that affect pulse pressure are stroke volume and arterial compliance. Pulse pressure is directly proportional to the stroke volume and inversely proportional to the arterial compliance. Thus, a decrease in arterial compliance would tend to increase pulse pressure.

MEDEMIA ACADEMY

Answers

40. D) Reduction in perfusion pressure to a tissue leads to a decrease in tissue oxygen concentration and an increase in tissue carbon dioxide concentration. Both events lead to an increase in arteriolar diameter, decreased vascular resistance, and increased vascular conductance.

41. B) Because oxygen is lipid soluble and can cross the capillary wall with ease, it has the fastest rate of movement across the capillary wall. The ability of lipid-insoluble substances such as sodium, albumin, and glucose to move across a capillary wall depends on the permeability of the capillary to lipid-insoluble substances. Because the capillary wall is relatively impermeable to albumin, it has the slowest rate of net movement across the capillary wall.

MEDEMIA ACADEMY

Answers

42. A) An increase in capillary wall permeability to water would increase capillary filtration rate, whereas increases in arteriolar resistance, plasma colloid osmotic pressure, and interstitial hydrostatic pressure would all decrease filtration rate. Plasma sodium concentration would have no effect on filtration.

43. A) The two main factors that affect pulse pressure are stroke volume and arterial compliance. Increases in stroke volume increase pulse pressure, whereas an increase in arterial compliance decreases pulse pressure. Hemorrhage and decreased venous return would decrease stroke volume and pulse pressure. In patients with patent ductus, stroke volume and pulse pressure are increased as a result of shunting of blood from the aorta to the pulmonary artery.

MEDEMIA ACADEMY

Answers

44. C) Movement of the leg muscles causes blood to flow toward the vena cava, which reduces venous hydrostatic pressure. An increase in right atrial pressure would decrease venous return and increase venous hydrostatic pressure. Pregnancy and the presence of ascitic fluid in the abdomen would tend to compress the vena cava and increase venous hydrostatic pressure in the legs.

45. A) During progressive hemorrhagic shock, the vasomotor center often fails, thus reducing sympathetic output. Decreases in arterial pressure will reduce urine output. Decreased blood flow throughout the body causes acidosis because of decreased removal of carbon dioxide. In progressive shock due to hemorrhage, capillary permeability increases and mean systemic filling pressure decreases.

MEDEMIA ACADEMY

Answers

46. D) Decreased cardiac output can result from a weakened heart or from a decrease in venous return. Increased venous compliance decreases the venous return of blood to the heart. Cardiac tamponade, surgically opening the chest, and severe aortic stenosis will effectively weaken the heart and thus decrease cardiac output. Moderate anemia will cause an arteriolar vasodilation, which increases venous return of blood back to the heart, thus increasing cardiac output.

MEDEMIA ACADEMY

Answers

47. E) Cardiac output increases in several conditions because of increased venous return. Cardiac output increases in hyperthyroidism because of the increased oxygen use by the peripheral tissues, resulting in arteriolar vasodilation and thus increased venous return. Beriberi causes increased cardiac output because a lack of the vitamin thiamine results in peripheral vasodilation. A-V fistulae also cause a decreased resistance to venous return, thus increasing cardiac output. Anemia, because of the decreased oxygen delivery to the tissues, causes an increase in venous return to the heart and thus an increase in cardiac output. Cardiac output decreases in patients with myocardial infarction.

MEDEMIA ACADEMY

Answers

48. B) During exercise there is very little change in cerebral blood flow, and coronary blood flow increases. Because of the increased sympathetic output, mean systemic filling pressure increases and the veins constrict. During exercise there is also a decrease in parasympathetic impulses to the heart.

49. B) Several factors contribute to decreased coronary flow in patients with ischemic heart disease. Some patients will have spasm of the coronary arteries, which acutely decreases coronary flow. However, the major cause of decreased coronary flow is an atherosclerotic narrowing of the lumen of the coronary arteries.

MEDEMIA ACADEMY

Answers

50. C) The major causes of death after myocardial infarction include a decrease in cardiac output that prevents tissues of the body from receiving adequate nutrition and oxygen delivery and prevents removal of waste materials. Other causes of death are pulmonary edema, which reduces the oxygenation of the blood, fibrillation of the heart, and rupture of the heart. Cardiac contractility decreases after a myocardial infarction.

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Answers

51. E) During sympathetic stimulation, venous reservoirs constrict, venous vascular resistance also increases, arterioles constrict (which increases their resistance), and the heart rate increases. The epicardial coronary vessels have a large number of alpha receptors, but the subendocardial vessels have more beta receptors. Therefore, sympathetic stimulation causes at least a slight constriction of the epicardial vessels. This results in a slight decrease in epicardial flow.

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