Test Bank for first 4 lectures by abdallah alanzy

1. All of the following are known to cause vasodilation in local tissues EXCEPT:

A. Endothelin-1 release

B. Adenosine release

C. Nitric oxide release

D. Accumulation of CO_2 in tissue

E. Elevated potassium ions in interstitial fluid

Correct answer: A Endothelin-1 → strong vasoconstrictor

2. When blood supply to a tissue is briefly occluded and then restored, blood flow to that tissue transiently increases above normal. This phenomenon is known as:

A. Functional sympatholysis

B. Reactive hyperemia

C. Ischemic compensation

D. Active hyperemia

E. Autoregulation

Correct answer: B

3. A patient has bounding peripheral pulses and a "water-hammer" pulse pressure. Blood pressure is 160/50 mmHg. These findings are most consistent with which valvular disorder?

A. Aortic stenosis

B. Mitral regurgitation

C. Aortic regurgitation

D. Mitral stenosis

E. Tricuspid regurgitation

Correct answer: C In aortic regurgitation, blood leaks back into the left ventricle during diastole → diastolic pressure falls. At the same time, the LV ejects a larger volume during systole → systolic pressure rises

4. Which substance, produced by endothelial cells, causes relaxation of vascular smooth muscle by increasing cGMP levels?

A. Thromboxane A_2

B. Nitric oxide

C. Norepinephrine

D. Angiotensin II

E. Endothelin

Correct answer: B

5. During dynamic exercise, systolic blood pressure rises while diastolic pressure remains the same or falls slightly. What happens to pulse pressure and why?

A. Pulse pressure increases due to increased stroke volume

B. Pulse pressure decreases due to vasodilation

C. Pulse pressure remains unchanged due to baroreceptor reflexes

D. Pulse pressure decreases due to shorter diastole

اللهم اصلح قلوبنا، واغفر ذنوبنا، وبارك لنا في أوقاتنا وأعمالنا

E. Pulse pressure increases due to increased blood viscosity

Correct answer: A PP = Systoly - Diastole

6. A trauma patient in hypovolemic shock has a blood pressure of 90/70 mmHg. What is the primary reason for the narrowed pulse pressure in this patient?

A. Increased arterial stiffness

B. Decreased stroke volume due to low preload

C. Excessive vasodilation

D. Compensatory tachycardia

E. Increased contractility

Correct answer: B ↓ PP → ↓ stoke volume

7. An elderly man with atherosclerotic narrowing of his carotid artery has a bruit audible over the artery. What is the cause of this bruit?

A. Increased turbulence of blood flow due to the narrowed vessel

B. Laminar flow at the site of the plaque

C. High blood viscosity causing resistance

D. Enhanced autoregulation of blood flow in the carotid

E. Vibration of the arterial wall from high pressure

Correct answer: A audible → turbulence

8. Which growth factor is most important for stimulating new blood vessel formation (angiogenesis) in tissues chronically lacking adequate perfusion?

A. Vascular Endothelial Growth Factor (VEGF)

B. Epidermal Growth Factor (EGF)

C. Angiotensin II

D. Norepinephrine

E. Nitric oxide

Correct answer: A

9. Which statement correctly describes laminar blood flow in a vessel?

A. Laminar flow generates audible vibrations in the vessel

B. Flow velocity is uniform across the vessel lumen

C. The fluid moves in concentric layers, with no mixing between layers

D. Fluid particles move randomly in all directions

E. The highest velocity is at the vessel wall

Correct answer: C laminar → silent / Parabolic Velocity

10. In which segment of the circulatory system does the largest drop in blood pressure occur?

A. Large arteries

B. Capillaries

C. Arterioles

D. Veins
E. Aorta
Correct answer: C arterioles → high Resestance

11. During heavy exercise, sympathetic output is high, yet arterioles in active muscles dilate to provide more blood flow. What explains this vasodilation in active skeletal muscles?
A. Parasympathetic signals override sympathetic effects in active muscle
B. Local metabolic factors in muscle override sympathetic vasoconstriction
C. Myogenic responses (stretch) to high pressure cause dilation
D. Sympathetic β_1-receptors cause muscle vasodilation
E. Complete withdrawal of sympathetic tone to active muscles
Correct answer: B

12. Which organ's circulation features two capillary beds in series (one after the other)?
A. Brain
B. Kidney
C. Liver
D. Heart
E. Lungs
Correct answer: B

13. Which vessels are primarily responsible for regulating blood flow into capillary beds and are the major contributors to total peripheral resistance?
A. Capillaries
B. Large elastic arteries
C. Arterioles
D. Venules
E. Medium muscular arteries
Correct answer: C arterioles → high Resestance

14. Which organ is considered a "reconditioning" organ that normally receives blood flow far in excess of its own metabolic needs (allowing it to adjust the composition of blood)?
A. Brain
B. Spinal cord
C. Kidneys
D. Heart
E. Skeletal muscle
Correct answer: C

15. An older patient has gradual occlusion of his left coronary artery over many years but does not experience a myocardial infarction. Which adaptation most likely prevented ischemic injury to the heart muscle?

A. Hypertrophy of cardiac myocytes to reduce oxygen demand
B. Collateral blood vessel development bypassing the occlusion
C. Arteriolar constriction in the heart to limit blood flow
D. Increased blood viscosity improving oxygen delivery
E. Increased heart rate maintaining perfusion
Correct answer: B

16. If the resistance in an organ's arterioles doubles (and the pressure gradient is unchanged), what happens to the blood flow to that organ?
A. It is unchanged
B. It decreases to about half
C. It increases two-fold
D. It decreases to about one-quarter
E. It increases slightly
Correct answer: B

$F = \frac{\Delta P}{R} \rightarrow F = \frac{\Delta P}{2R} \rightarrow F = \frac{1}{2}\frac{\Delta P}{R}$

17. Which organ has the most effective autoregulation of blood flow, able to keep flow relatively constant across a wide range of perfusion pressures?
A. Skin
B. Brain
C. Liver
D. Skeletal muscle
E. Heart
Correct answer: B

18. A 25-year-old woman with severe iron-deficiency anemia is noted to have a faint systolic murmur. Which of the following best explains the murmur in this patient?
A. Hyperdynamic left ventricular contraction due to anemia
B. Turbulent blood flow due to decreased blood viscosity
C. Delayed closure of the aortic valve
D. Impaired autoregulation in systemic circulation
E. High blood viscosity causing sluggish flow
Correct answer: B ↓ viscosity → Turbulent

19. An arteriovenous fistula (direct connection between an artery and vein) has what effect on systemic vascular resistance?
A. It increases resistance by adding an extra pathway
B. It decreases resistance by allowing blood to bypass arterioles
C. It initially increases then decreases resistance
D. It increases only pulmonary resistance
E. It has no effect on total resistance
Correct answer: B

the high-resistance arterioles are skipped, the total systemic vascular resistance decreases.

20. A 70-year-old man has a blood pressure of 150/90 mmHg. What is the approximate mean arterial pressure (MAP) in this individual?

A. 140 mmHg

B. 100 mmHg

C. 110 mmHg

D. 90 mmHg

E. 120 mmHg

Correct answer: C MAP = $\frac{2}{3}$ Diastolic + $\frac{1}{3}$ systolic

21. A patient in hypovolemic shock has pale, cool skin. What mechanism causes this skin finding?

A. Excess perfusion of the skin

B. Intense sympathetic vasoconstriction of cutaneous vessels

C. Parasympathetic activation of cutaneous arteries

D. Accumulation of local metabolites in skin

E. Bradycardia induced by baroreceptors

Correct answer: B Blood shunted to vital organs like brain

22. Despite changes in arterial pressure, certain tissues adjust their vascular resistance to maintain a relatively constant blood flow. What is this phenomenon called?

A. Reactive hyperemia

B. Autoregulation

C. Active hyperemia

D. Sympathetic reflex

E. Hysteresis

Correct answer: B

23. Which statement correctly describes the autonomic innervation of most systemic arterioles?

A. Sympathetic stimulation causes vasodilation in most arterioles

B. They are richly innervated by sympathetic fibers but have little to no parasympathetic innervation

C. They receive both sympathetic and parasympathetic innervation equally

D. Parasympathetic nerves primarily regulate arteriolar tone at rest

E. Arterioles are not innervated; they only respond to local factors

Correct answer: B Rem: vasodilation mainly from local metabolic factors

24. During strenuous exercise, which organ receives a substantially greater percentage of the cardiac output compared to resting conditions?

A. Kidneys

B. Brain

C. Liver

D. Skeletal muscle

E. Skin

Correct answer: D

25. In the pulmonary circulation, low oxygen levels in alveoli cause:

A. Vasoconstriction of pulmonary arterioles

B. Vasodilation of pulmonary arterioles

C. Systemic arterial vasoconstriction

D. No change in vessel tone

E. Reflex bradycardia

Correct answer: A This hypoxic vasoconstriction redirects blood away from poorly ventilated areas toward better-oxygenated regions

26. All of the following conditions would increase blood viscosity EXCEPT:

A. Severe anemia

B. Polycythemia vera (high RBC count)

C. Multiple myeloma (increased plasma proteins)

D. High hematocrit

E. Severe dehydration

Correct answer: A

27. Which of the following correctly describes the structure of capillaries?

A. Single endothelial cell layer with no smooth muscle

B. Thick walls with multiple smooth muscle layers

C. Surrounded by a layer of cardiac muscle cells

D. Containing valves to prevent backflow

E. High content of elastic fibers

Correct answer: A

28. Which of the following factors is the most important regulator of cerebral blood flow under normal conditions?

A. Sympathetic nervous activity

B. Circulating epinephrine

C. Arterial PCO_2 (carbon dioxide levels)

D. Central venous pressure

E. Arterial PO_2 (oxygen levels)

Correct answer: C Even small increases in CO_2 cause strong

29. The dicrotic notch (incisura) observed in the aortic pressure waveform is caused by:

A. Closure of the aortic valve

B. Reflection of the pressure wave in peripheral arteries

C. Opening of the aortic valve

D. Closure of the mitral valve

E. Turbulent flow in the aorta

Correct answer: A

30. Chronic hypertension causes structural changes in blood vessels. How do small arteries and arterioles adapt to sustained high pressures?

A. They become thinner-walled to allow more stretch

B. They permanently dilate to accommodate higher pressure

C. They undergo inward remodeling, reducing lumen diameter to normalize wall stress

D. They decrease smooth muscle content over time

E. They lengthen significantly to dissipate pressure

Correct answer: C علشان تقل الشدّ على الجدار (wall stress) وما ينفجر الشريان.

31. All of the following mechanisms aid in venous return to the heart EXCEPT:

A. Standing absolutely still for a long period

B. Sympathetic venous tone (venoconstriction)

C. Presence of one-way valves in veins

D. Contraction of leg muscles during movement

E. Deep inspiration (negative intrathoracic pressure)

Correct answer: A

32. If arterioles in a certain tissue constrict, what will be the effect on the pressures in the arteries upstream and capillaries downstream in that tissue?

A. Both upstream and downstream pressures will fall

B. Upstream arterial pressure will rise, downstream capillary pressure will fall

C. Upstream arterial pressure will fall, downstream capillary pressure will rise

D. Pressures will remain unchanged due to autoregulation

E. Both upstream and downstream pressures will rise

Correct answer: B ↑ Resistanse → ↓ flow to capillary

33. Precapillary sphincters are small rings of smooth muscle located at the entrance to capillary beds. What is their primary function?

A. Regulating blood flow into capillaries based on local tissue needs

B. Maintaining constant flow regardless of tissue activity

C. Preventing blood backflow into arterioles

D. Generating high pressure to drive blood through capillaries

E. Pumping blood in the absence of arterial pressure

Correct answer: A

34. Low-dose epinephrine infusion typically causes a decrease in diastolic blood pressure due to vasodilation in skeletal muscle. Which receptors mediate this vasodilatory effect of epinephrine on skeletal muscle blood vessels?

A. β_2-adrenergic receptors

B. α_2-adrenergic receptors

C. α_1-adrenergic receptors

D. β_1-adrenergic receptors

E. Muscarinic (M_3) receptors on endothelium

Correct answer: A on skeletal muscle/not on Blood Vessels → ∠2

35. Mean arterial pressure (MAP) is closer to diastolic pressure than to systolic pressure because:

A. The heart spends more time in diastole than systole during each cardiac cycle

B. Systolic pressure is an overestimate of tissue perfusion

C. Pulse pressure is generally small in magnitude

D. Most of the blood volume is on the venous side

E. Arteries dampen systolic pressure completely

مدة الدورة القلبية كاملة ≈ 0.8 ثانية
Systole ≈ 0.27 ثانية (ثلث الوقت تقريبًا)
Diastole ≈ 0.53 ثانية (ثلثين الوقت تقريبًا)

Correct answer: A

36. During intense exercise, blood flow to skeletal muscles increases dramatically. The primary cause of this increased perfusion is:

A. Sympathetic activation of α_1-receptors in muscle arterioles

B. Rise in systemic arterial pressure during exercise

C. Local release of vasodilator metabolites in active muscles

D. Parasympathetic dilation of muscle arterioles

E. Myogenic relaxation due to decreased transmural pressure

Correct answer: C

37. Which statement about resistances arranged in parallel (as in the systemic circulation among organs) is correct?

A. Total resistance is less than the resistance of any single branch

B. Total resistance equals the sum of individual resistances

C. All organs in parallel receive different perfusion pressures

D. Blood flow through each organ must be identical

E. There is significant loss of pressure in major arteries in a parallel network

Correct answer: A Total resistance $= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots$

38. How is continuous blood flow in capillaries maintained despite the intermittent output of the heart?

A. Metarterioles provide an alternate route during cardiac diastole

B. Elastic recoil of the large arteries (Windkessel effect) maintains flow during diastole

C. Small arterioles contract rhythmically to push blood

D. Capillaries store blood and release it steadily

E. One-way valves in arteries ensure continuous forward flow

Correct answer: B

39. If the radius of a blood vessel is doubled (with all other factors constant), how will the blood flow through that vessel change?

A. It will remain unchanged
B. It will increase by a factor of 4
C. It will increase by a factor of 8
D. It will increase by a factor of 16
E. It will double
Correct answer: D $R = \frac{8\eta L}{\pi r^4}$ $R = \frac{8\eta L}{\pi (2r)^4}$ $R = \frac{1}{16} \times \frac{8\eta L}{\pi r^4} \Rightarrow F = \frac{\Delta P}{\frac{1}{16}R}$ $F = 16\frac{\Delta P}{R}$

40. All of the following changes will increase blood flow through a vessel EXCEPT:
A. Increasing the pressure gradient along the vessel
B. Decreasing the vessel length
C. Decreasing blood viscosity
D. Increasing the vessel radius
E. Increasing hematocrit significantly
Correct answer: E

41. All of the following tend to increase pulse pressure EXCEPT:
A. Increased arterial stiffness (decreased compliance)
B. Increased stroke volume
C. Exercise (increased contractility)
D. Hyperthyroidism (high output state)
E. Significant hemorrhage
Correct answer: E in hemorrhage, blood volume and stroke volume fall

42. Blood flow through the circulatory system is primarily driven by:
A. One-way valves in the arterial system
B. The pressure difference between the arterial and venous ends of the circulation
C. High oxygen content in arterial blood
D. The suction effect of the heart during diastole
E. The body's gravitational field
Correct answer: B flow → pressure gradient $F \propto \Delta P / F \propto \frac{1}{R}$

43. Korotkoff sounds heard during blood pressure measurement are caused by:
A. Laminar flow in the brachial artery
B. Turbulent blood flow through a partially compressed artery
C. Closure of the aortic valve
D. Pulse pressure oscillations in the artery
E. Resonance of the arterial wall
Correct answer: B Turbulent → audible

44. In severe hemorrhage, the body prioritizes blood flow to vital organs. Which organ's blood flow is best preserved until the latest stages of shock?
A. Kidneys
B. Brain

C. Skin
D. Skeletal muscle
E. Intestines
Correct answer: B

45. A higher Reynolds number indicates a greater tendency for blood flow to become turbulent. Blood flow in a straight, smooth vessel will generally become turbulent when:
A. Vessel diameter exceeds 1 cm
B. Reynolds number is roughly greater than 2000
C. Blood viscosity is very high
D. Flow velocity is low
E. Hematocrit drops below 40%
Correct answer: B

46. The ability of a blood vessel to change its volume with changes in pressure is known as:
A. Elastance
B. Compliance
C. Contractility
D. Wall tension
E. Viscosity
Correct answer: B $\text{Compliance} = \frac{\Delta V}{\Delta P}$

47. Which organ has the highest blood flow per unit weight of tissue (mL/min per 100 g) under resting conditions?
A. Heart muscle
B. Brain
C. Kidney
D. Liver
E. Skeletal muscle
Correct answer: C

48. In an elderly patient with arteriosclerosis (stiffening of large arteries), which of the following changes in blood pressure is most likely present?
A. Widened pulse pressure due to increased systolic pressure
B. Low systolic and diastolic pressures
C. Narrowed pulse pressure
D. Elevated diastolic pressure with normal systolic pressure
E. Reduced mean arterial pressure
Correct answer: A arteriosclerosis → ↑ systolic pressure, =/↓ diastolic pressure → PP = SP − DP → ↑ PP

49. Prolonged use of glucocorticoid medications (corticosteroids) has what effect on the vasculature?

A. Increased capillary density in tissues
B. Inhibition of new vessel formation (decreased vascularity)
C. Enhanced nitric oxide release by endothelium
D. Tendency for vasodilation and hyperemia
E. Increased VEGF-mediated angiogenesis
Correct answer: B

Glucocorticoids inhibit angiogenesis by

50. Which of the following correctly describes a difference between veins and arteries?
A. Veins have thinner walls and often contain valves, whereas arteries do not
B. Veins recoil more elastically than arteries when stretched
C. Veins carry oxygenated blood, while arteries carry deoxygenated blood
D. Veins generally have higher internal pressure than arteries
E. Veins have more smooth muscle and thicker walls than similar-sized arteries
Correct answer: A

51. If total peripheral resistance is significantly decreased without a change in cardiac output, what will happen to mean arterial pressure (MAP)?
A. MAP will increase
B. MAP will decrease
C. MAP will remain unchanged
D. Pulse pressure will increase but MAP unchanged
E. Blood flow will cease
Correct answer: B

$\downarrow TPR = \frac{\downarrow MAP - RAP}{Q}$

52. An older patient has a blood pressure of 160/70 mmHg (pulse pressure 90 mmHg). The elevated pulse pressure in this patient is primarily due to:
A. Reduced arterial compliance (stiff arteries) with age
B. Increased blood viscosity
C. Decreased cardiac contractility
D. Narrowing of the aortic valve (stenosis)
E. Reduced stroke volume
Correct answer: A

Stiff arteries cannot expand during systole → systolic pressure rises, while diastolic pressure often falls or stays low.

53. During maximal exercise, blood flow to which organ is significantly decreased compared to resting values?
A. Heart
B. Kidneys
C. Skin (in a cool environment)
D. Active skeletal muscle
E. Brain
Correct answer: B

54. A certain vessel (A) is twice as long as another similar vessel (B), but they have the

same radius and blood viscosity. How does the resistance of vessel A compare to vessel B?

A. The resistance is about half that of B

B. The resistance is about twice that of B

C. The resistance is about 16 times that of B

D. The resistance is the same as B

E. Length has no effect on resistance

Correct answer: B $R = \frac{8\eta L}{\pi r^4} \rightarrow R = \frac{8\eta 2L}{\pi r^4} \rightarrow R = 2\frac{8\eta L}{\pi r^4}$

55. Pulmonary vascular resistance is approximately what fraction of systemic vascular resistance?

A. About the same (1:1)

B. About 1/2

C. About 1/3

D. About 1/10

E. About 2 times higher

Correct answer: D Pulmonary vascular resistance is much lower than systemic resistance—about one-tenth. This is because the pulmonary vessels are thin-walled, highly compliant, and designed for low-pressure, low-resistance flow.

56. According to Laplace's law (T = P × r), what happens to wall tension when an arterial aneurysm enlarges (increases its radius)?

A. Wall tension decreases

B. Wall tension increases

C. Wall tension is unaffected by radius

D. Wall tension drops to zero

E. Wall tension becomes independent of pressure

Correct answer: B

57. Which of the following is TRUE for blood vessels arranged in series within an organ?

A. The total resistance equals the sum of individual resistances

B. The flow is the same through each segment of the series

C. The pressure is the same at the start and end of each segment

D. Adding another vessel in series will not affect total resistance

E. Each segment receives a different fraction of the total blood flow

Correct answer: B Series → Total resistance = Sum of individual resistances
Vascular bed resistance largely determined by arterioles
Flow constant at each level

58. A 30-year-old man donates a kidney. After recovery, which of the following changes is expected?

A. Increased total peripheral resistance

B. Decreased cardiac output

C. Decreased mean arterial pressure

D. Increased blood viscosity

E. Decreased systemic arterial pressure

Correct answer: A

To compensate, the remaining kidney increases its filtration, and the body raises total peripheral resistance to maintain normal MAP and renal perfusion

59. An expanding aortic aneurysm is at increasing risk of rupture because wall tension increases as radius increases. This principle is explained by:

A. Poiseuille's law

B. Laplace's law

C. Boyle's law

D. Frank-Starling mechanism

E. Bernoulli's principle

Correct answer: B Laplace's Low (T = P × r)

60. A 22-year-old man stands up quickly and feels lightheaded. Which physiological change is the most immediate cause of his dizziness?

A. A sudden drop in systemic vascular resistance

B. Pooling of blood in the leg veins, reducing venous return

C. A rapid decrease in heart rate upon standing

D. An abrupt increase in cerebral blood flow

E. A sudden drop in pulmonary arterial pressure

Correct answer: B

61. Which receptor mediates vasodilation in skeletal muscle arterioles during a "fight or flight" response (such as low-dose epinephrine release)?

A. β_2-adrenergic receptors

B. Muscarinic M_2 receptors

C. α_1-adrenergic receptors

D. β_1-adrenergic receptors

E. α_2-adrenergic receptors

Correct answer: A

62. A higher Reynolds number indicates a greater tendency for blood flow to become turbulent. Although blood density contributes to Reynolds number, which factors are most influential in determining turbulence?

A. High viscosity and low velocity favor turbulence

B. High velocity and large vessel diameter favor turbulence

C. Low cardiac output and high hematocrit favor turbulence

D. High blood density is the key determinant of turbulence

E. High viscosity and small vessel diameter favor turbulence

Correct answer: B Reynolds number = $\frac{\rho V D}{\eta}$ ρ: كثافة D: قطر V: سرعة η: لزوجة

63. Which of the following hormones causes potent arteriolar vasoconstriction and an increase in total peripheral resistance?

A. Atrial natriuretic peptide (ANP)

B. Angiotensin II

C. Histamine

D. Bradykinin

E. Nitric oxide

Correct answer: B

64. Which of the following statements about laminar versus turbulent blood flow is correct?

A. Turbulent flow requires more pressure to drive blood flow than laminar flow

B. Laminar flow tends to occur at high Reynolds numbers

C. Turbulent flow is silent, whereas laminar flow produces murmurs

D. Laminar flow has mixed fluid layers moving in all directions

E. Turbulent flow is more energy-efficient than laminar flow

Correct answer: A

65. Which of the following circulatory arrangements is unique in that one organ receives blood that has first passed through another organ?

A. Coronary circulation

B. Renal circulation

C. Cerebral circulation

D. Hepatic (liver) circulation

E. Skeletal muscle circulation

Correct answer: D

66. A 75-year-old man has a BP of 160/70 mmHg. His pulse pressure is increased primarily because of:

A. Decreased arterial compliance (stiffer arteries) with age

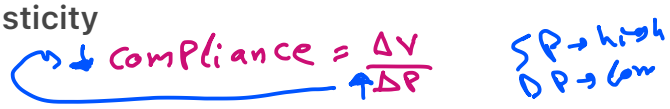
B. Reduced stroke volume

C. Increased blood viscosity

D. Aortic valve stenosis

E. Enhanced arterial elasticity

Correct answer: A



67. Blood flow to the skin is primarily regulated by:

A. Sympathetic nervous system activity (for temperature control)

B. Local metabolic demands of skin tissue

C. Parasympathetic vasodilator fibers

D. Myogenic autoregulation

E. Endothelin release in the dermal vessels

Correct answer: A

68. During a prolonged, steady-state exercise, blood flow to the kidneys and digestive organs is reduced compared to resting levels. This reduction is primarily due to:

A. Metabolic vasoconstriction in those organs

B. Increased sympathetic outflow causing arteriolar constriction in the splanchnic and renal

beds

C. Decreased arterial pressure during exercise

D. Autoregulatory decrease in those organs' perfusion

E. Passive collapse of vessels from muscle contractions

Correct answer: B

69. Compliance = ΔV/ΔP. Which vessels have the highest compliance, allowing them to accommodate large volumes of blood with only small pressure changes?

A. Elastic arteries

B. Arterioles

C. Capillaries

D. Veins

E. Pulmonary arteries

Correct answer: D Veins → have low ΔP (Thin walled) so → high compliance Veins (Blood reservoir)

70. An elderly patient's carotid artery pulse pressure waveform shows an absent dicrotic notch. Which valvular pathology is most likely?

A. Aortic regurgitation (incompetent aortic valve)

B. Aortic stenosis (narrowed aortic valve)

C. Mitral regurgitation

D. Mitral stenosis

E. Tricuspid regurgitation

Correct answer: A

71. The **Windkessel effect** **refers to the:**

A. Reflex increase in heart rate when blood pressure falls

B. Elastic recoil of large arteries that maintains blood flow during diastole

C. Myogenic response of arterioles to stretch

D. Compression of veins by skeletal muscle to aid venous return

E. Active hyperemia in exercising muscle

Correct answer: B

72. Long-term exposure to high altitude leads to chronic low arterial O_2. In the pulmonary circulation, this causes:

A. Diffuse vasoconstriction of pulmonary arterioles and increased pulmonary arterial pressure

B. Global vasodilation in pulmonary arterioles and decreased pulmonary pressure

C. No change in pulmonary vascular resistance

D. Recruitment of new pulmonary capillaries to reduce pressure

E. Reflex systemic vasoconstriction

Correct answer: A ↓P_{O_2} ↑P_{CO_2} → Vasoconstriction

73. A 32-year-old man has an arteriovenous fistula in his leg. How would this affect his

circulatory dynamics?

A. It would decrease total peripheral resistance by shunting blood directly from artery to vein

B. It would increase total peripheral resistance by adding another pathway

C. It would decrease cardiac output due to blood bypassing capillaries

D. It would cause reflex bradycardia

E. It would elevate arterial blood pressure

Correct answer: A

74. The presence of one-way valves and the compressive action of skeletal muscles are mechanisms that:

A. Increase arterial blood pressure

B. Facilitate venous return to the heart

C. Prevent arterial backflow during diastole

D. Directly regulate capillary perfusion

E. Reduce turbulent flow in arteries

Correct answer: B

75. Which of the following will **decrease blood flow to an organ, assuming perfusion pressure is constant?**

A. Decreasing the length of the organ's blood vessels

B. Decreasing the blood viscosity

C. Increasing the radius of the arterioles

D. Increasing arteriolar resistance via vasoconstriction

E. Increasing the organ's metabolic activity

Correct answer: D

76. A 67-year-old man has isolated systolic hypertension due to stiffening of his arteries. Which of the following findings would be expected in his arterial pressures?

A. Elevated systolic pressure with a widened pulse pressure

B. Low diastolic pressure with a narrow pulse pressure

C. Low systolic and diastolic pressures

D. Elevated diastolic pressure and normal systolic pressure

E. A large dicrotic notch on the aortic pressure waveform

Correct answer: A

77. In the coronary circulation of the left ventricle, the majority of blood flow occurs during which phase of the cardiac cycle and why?

A. Systole, because ventricular contraction propels blood into coronary arteries

B. Diastole, because contraction in systole compresses the coronary vessels

C. Equally in systole and diastole, because flow is continuous

D. Only during exercise, because coronary vessels collapse at rest

E. Systole for the right coronary, diastole for the left coronary

Correct answer: B

78. Most systemic organs are arranged in parallel. Which organ is an exception in that it receives blood that has first passed through another organ?

A. Brain

B. Liver (via the hepatic portal circulation)

C. Heart

D. Kidneys

E. Skeletal muscle

Correct answer: B

79. A 28-year-old man hyperventilates (breathes rapidly and deeply) for two minutes. He becomes lightheaded and nearly faints. The most likely cause is that hyperventilation:

A. Lowers arterial CO_2, causing cerebral vasoconstriction and reduced brain blood flow

B. Raises arterial O_2, causing cerebral vasodilation and steal phenomenon

C. Activates baroreceptors, causing widespread vasodilation

D. Increases intrathoracic pressure, impeding venous return to the heart

E. Causes metabolic acidosis, reducing cardiac output

Correct answer: A

80. Which of the following best explains why the pressure pulsations diminish (dampen) as blood travels from the large arteries to the arterioles and capillaries?

A. Decreased blood viscosity and turbulence

B. High resistance and compliance of the vascular system in the periphery

C. Increased sympathetic stimulation of small vessels

D. Reflections of pressure waves in the microcirculation

E. Reduction in cardiac output at the microvascular level

Correct answer: B

81. In a series arrangement of blood vessels (e.g., arteries → arterioles → capillaries within an organ), which of the following is constant at all levels?

A. Pressure drop across each segment

B. Flow rate (volume per minute) through each segment

C. Blood pressure in each segment

D. Resistance of each segment

E. Velocity of blood flow in each segment

Series →

Total resistance = Sum of individual resistances

Vascular bed resistance largely determined

Correct answer: B

82. An important benefit of the parallel arrangement of systemic circulation is that:

A. Each organ receives fully oxygenated blood at roughly the same pressure as the aorta

B. Total resistance is higher, which helps maintain blood pressure

C. Blood flows through organs sequentially to maximize oxygen extraction

D. Changes in one organ's blood flow do significantly impact others

E. Arterial pressure drops steeply after the first organ in parallel

Correct answer: A Parallel +

1. All organs receive blood of same composition
2. Blood flow to each organ independently adjusted

83. Which of the following is a potent vasoconstrictor released into the blood to help regulate arterial blood pressure?

A. Angiotensin II

B. Atrial natriuretic peptide (ANP)

C. Prostacyclin

D. Histamine

E. Adenosine

Correct answer: A

84. The **mean arterial pressure (MAP) is not simply the average of systolic and diastolic pressures because:**

A. The heart spends about two-thirds of the cardiac cycle in diastole at rest

B. Pulse pressure is very small in magnitude

C. Blood viscosity skews the pressure distribution

D. Systolic pressure is higher in the large arteries than in the aorta

E. Venous pressure influences the MAP significantly

Correct answer: A

85. A 24-year-old sprinter has a resting heart rate of 55 bpm and a stroke volume of 90 mL. Which of the following is his approximate resting cardiac output and what primarily determines it?

A. 4.95 L/min, determined by heart rate and stroke volume (HR × SV)

B. 2.0 L/min, determined by total blood volume

C. 7.5 L/min, determined by venous return only

D. 3.6 L/min, determined by oxygen demand of tissues

E. 10.0 L/min, determined by blood pressure

Correct answer: A CO = HR . SV → 90 x 55 = 4.95

86. A higher hematocrit (e.g., in polycythemia) affects blood flow by:

A. Increasing blood viscosity and thus increasing resistance to flow

B. Decreasing blood viscosity and thus decreasing resistance

C. Predisposing to turbulence by itself

D. Narrowing the blood vessels reflexively

E. Improving tissue oxygen delivery without affecting flow

Correct answer: A

87. The majority of the body's blood volume at any given time is found in the:

A. Pulmonary circulation

B. Heart (chambers)

C. Systemic veins and venules

D. Systemic arteries

E. Capillaries

Correct answer: C

88. Failure of the venous valves in the lower extremities is likely to result in:

A. Venous pooling and development of varicose veins

B. Increased venous return to the heart

C. Decreased capillary pressure in the legs

D. A sudden drop in arterial blood pressure

E. Prevention of edema formation

Correct answer: A

89. According to Poiseuille's law, which variable has the greatest influence on the resistance to blood flow in a vessel?

A. The vessel's radius

B. The vessel's length

C. The blood pressure

D. The type of vessel (artery vs. vein)

E. The blood viscosity

Correct answer: A

90. A key difference between laminar and turbulent blood flow is that turbulent flow:

A. Requires a greater pressure gradient to sustain the same flow

B. Is silent, whereas laminar flow is audible

C. Occurs at low Reynolds numbers

D. Has a parabolic velocity profile

E. Flows in smooth concentric layers

Correct answer: A

91. During a fight-or-flight response, which tissue experiences a decrease in blood flow due to sympathetic vasoconstriction?

A. Skeletal muscle (active)

B. Skin and gastrointestinal tract

C. Cardiac muscle

D. Brain

E. Adrenal medulla

Correct answer: B

92. Which vessels serve as the major **capacitance vessels, acting as a blood reservoir in the body?**

A. Arterioles

B. Capillaries

C. Pulmonary capillaries

D. Veins

E. Elastic arteries (e.g., aorta)

Correct answer: D

93. A 78-year-old man's arterial pulse is measured at the radial artery. Compared to the pressure pulse in the ascending aorta, the systolic pressure in the radial artery is:

A. Slightly higher, due to wave reflection and decreased arterial compliance

B. Much lower, due to resistance in large arteries

C. Essentially identical, because arteries have negligible resistance

D. Lower, because diastolic pressure is higher in peripheral arteries

E. Non-pulsatile by the time it reaches the radial artery

Correct answer: A

As the pressure wave travels from the aorta to peripheral arteries (like the radial artery), wave reflection and stiffer peripheral arteries make the systolic pressure increase slightly.

94. Which factor is primarily responsible for the large increase in skeletal muscle blood flow during exercise?

A. Increased local production of vasodilator metabolites (e.g., adenosine, K^+) in muscle

B. Parasympathetic activation of muscle arterioles

C. Myogenic autoregulation from elevated blood pressure

D. Sympathetic α_1-mediated vasodilation in muscle

E. Baroreceptor stimulation increasing muscle perfusion

Correct answer: A

95. During prolonged standing, why might edema develop in the lower extremities?

A. Increased venous pressure leads to increased capillary hydrostatic pressure and fluid filtration

B. Decreased arterial pressure in the legs causes fluid leakage

C. Excess muscle activity drives fluid out of capillaries

D. Enhanced lymphatic drainage is overwhelmed by posture

E. Baroreceptor reflex causes capillary permeability to increase

Correct answer: A

96. Most arterioles in the systemic circulation are richly innervated by sympathetic nerve fibers. What is the effect of sympathetic stimulation on arterioles?

A. It causes vasoconstriction via α_1-adrenergic receptors, increasing resistance

B. It causes vasodilation in most tissues via β_2-adrenergic receptors

C. It has little effect on arteriolar tone

D. It primarily affects veins, not arterioles

E. It reduces arterial blood pressure by dilating arterioles

Correct answer: A

97. A tissue becomes highly active (e.g., exercising muscle), and its blood flow increases in proportion to its metabolic activity. This phenomenon is known as:

A. Active hyperemia

B. Autoregulation
C. Reactive hyperemia
D. Myogenic response
E. Neurogenic hyperemia
Correct answer: A

98. In the microcirculation, the pressure pulsations from the heart are nearly eliminated. What two factors account for this damping of pulsatile flow by the time blood reaches the capillaries?
A. The resistance of small vessels and the compliance of the arterial tree
B. The high viscosity of blood and one-way valves in capillaries
C. The increase in velocity and turbulent flow in arterioles
D. The baroreceptor reflex and sympathetic tone
E. The intermittent opening/closing of precapillary sphincters
Correct answer: A

99. A 72-year-old man with a blood pressure of 155/95 is started on a vasodilator drug that causes arteriolar dilation throughout the body. If his cardiac output does not change, what will happen to his mean arterial pressure?
A. It will decrease, because total peripheral resistance is reduced
B. It will increase, because flow to each organ increases
C. It will remain the same, due to compensatory mechanisms
D. It will increase, because pulse pressure narrows
E. It will increase only in the dilated organs
Correct answer: A Vasodilator → ↓TPR = ↓MAP - RAP / CO

100. An important benefit of arranging the systemic circulation in parallel (each organ supplied by an aortic branch) rather than in series is that:
A. All organs receive blood of the same high oxygen content and nearly the same pressure
B. Total peripheral resistance is higher, ensuring adequate blood pressure
C. Blood flows from one organ directly to the next, optimizing nutrient use
D. Downstream organs receive blood with higher CO_2 and metabolite levels
E. A change in one organ's blood flow equally affects flow to other organs
Correct answer: A Parallel → 1. All organs receive blood of same composition 2. Blood flow to each organ independently adjusted

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