

Physiology

Dr. Fatima

107. Which of the following has the highest velocity of blood?

- A) Aorta
- B) Capillaries
- C) Small arteries
- D) arterioles

ANSWER : A

108. A group of your colleagues are inventing an artificial blood vessel, they found out Reynold's number to be high, which of the following is true regarding Reynolds number?

- A) Thrombosis would decrease Reynold's number
- B) Anemia causes an increase in Reynold's number

ANSWER : B

109. Which of the following is true regarding resistance ?

- A) Amputation of a limb will not increase the overall resistance
- B) When the diameter of the artery is increased it will increase the conduction at a certain pressure.
- C) The total resistance is lower than the resistance in the arterioles alone

ANSWER : B

110. Which of the following is a function of Angiotensin 2?

- A) Acts on hypothalamus to decrease thirst
- B) Acts directly on the arterioles by binding to Gprotein coupled AT2 receptors to cause vasoconstriction
- C) Acts directly on the kidney to increase excetion of water and Na⁺
- D) Acts on zona glomerulosa cells of the adrenal cortex to stimulate the synthesis and secretion of aldosterone.

ANSWER : D

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111. A patient with renal failure undergoes dialysis, and arteriovenous (A-V fistula) directly from the radial artery to the antecubital vein of the forearm is created to permit vascular access for dialysis. What occurred to the venous side?

- A) Inward eutrophic remodelling
- B) Hypertrophic remodeling
- C) Outward remodeling
- D) Outward hypertrophic remodeling

ANSWER : D

112. Which of the following is a vasoconstrictor ?

- A) Bradykinin
- B) Histamine
- C) Endothelin

ANSWER : C

113. True regarding neural BP control:

- A) Information from the carotid sinus and aortic arch baroreceptors is carried by vagus nerve
- B) The carotid sinus baroreceptors are responsive to increases or decreases in arterial pressure

ANSWER : B

114. Regarding Reynold's number, which of the following is correct?

- A) Anemia causes an increase in Reynold's number
- B) Thrombosis decreases Reynold's number
- C) Increased blood viscosity increases Reynold's number
- D) When Reynolds' number rises above approximately 2000, turbulence will not occur.

ANSWER : A

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115. Which of the following is true regarding local control of tissue blood flow?

- A) Reactive hyperemia is when a tissue becomes highly active, such as an exercising muscle so the rate of blood flow through the tissue increases
- B) Active hyperemia is When the blood supply to a tissue is blocked for a few seconds to hours then is unblocked, blood flow through the tissue usually increases immediately
- C) Angiogenesis is stimulated by increased metabolic requirements and tissue hypoxia

ANSWER : C

116. In case the diameter of arterioles decreased, what would happen to flow, conductance and resistance ?

- A) Decrease, decrease, increase
- B) Decrease, increase, decrease
- C) Increase, decrease, increase
- D) Increase, increase, decrease

ANSWER : A

117. Which of the following is most probably a cause of high pulse pressure?

- A) Increased compliance
- B) Decreased compliance

ANSWER : B

118. Increased tone of arteries and resistance vessels can be due to

ANSWER : Increased endothelin

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119. All of the following regarding turbulence is correct except:

- A) It is associated with the sounds of the closure of heart valves .
- B) Turbulence is associated with more resistance than laminar blood flow .
- C) Turbulence is directly proportional to the cube root of the driving pressure.
- D) It is associated with very high velocity of the blood.
- E) It occurs normally in the aorta and narrowed blood vessels

ANSWER : C

120. The major structure that contributes to peripheral resistance is:

- A) Aorta
- B) Arterioles
- C) Vena Cava
- D) Capillaries
- E) Venules

ANSWER : B

121. Resistance to laminar flow is :

ANSWER : Inversely proportional to the fourth power of the radius.

122. Parallel arrangement of vessels ensures that all organs receive blood of the same composition.

- A) True
- B) False

ANSWER : A

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123. If $P = 90$ mm Hg at the beginning of vessel 1, and $P = 10$ mm Hg at the end of vessel 1, whereas $P = 190$ mm Hg at the beginning of vessel 2, and $P = 110$ mm Hg at the end of vessel 2. Which one has higher flow rate given the resistance is the same?

- A) Both have the same flow rate
- B) The information given is not enough
- C) Vessel 2
- D) Vessel 1

ANSWER : A

124. One of the following statements is correct regarding laminar flow:

- A) Turbulent flow is always pathological
- B) It has parabolic profile of velocity.
- C) All blood particles flow in the same speed within a vessel.

ANSWER : B

125. If you removed a kidney for a patient, what will be the effect on total resistance?

- A) Total resistance will increase
- B) Total resistance will decrease
- C) Total resistance will not change

ANSWER : A

126. High Oxygen level is also a vasodilator

- A) True
- B) False

ANSWER : B

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127. Elevated blood pressure will induce vasoconstriction.

- A) True
- B) False

ANSWER : A

128. Increased right atrial pressure will lead to:

ANSWER : Increased sodium loss

129. What factors cause stimulation of peripheral chemoreceptors?

ANSWER : Low O₂, high CO₂, low pH

130. An old man has a blood pressure of 180/100, A probable cause of his high pulse pressure is :

ANSWER : Decreased arterial compliance

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131. Which of the following does not increase pulse pressure?

- A) Aortic regurgitation
- B) Aortic stenosis
- C) Arteriosclerosis
- D) Patent ductus arteriosus

ANSWER : B

132. Which of the following is mostly true?

- A) A few minutes after removal of the obstruction there will be increased blood flow (the answer is meant to describe reactive hyperemia)
- B) Another option said that reperfusion occurred after an hour .

ANSWER : A

133. What do baroreceptors not do ?

ANSWER : Decrease renin secretion

134. In case of sudden increase in the peripheral pressure, what happens to the afferent impulses from baroreceptors and the effect of the efferent vasoconstrictor ?

ANSWER : Increased afferent impulses from baroreceptors, decreased efferent vasoconstrictor effect.

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135. Pulse pressure increases in :

ANSWER : Patent ductus arteriosus

136. Baroreceptor reflex does NOT work at all in patients with hypertension.

- A) True
- B) False

ANSWER : B

137. Peripheral and central chemoreceptors are most sensitive to O₂.

- A) True
- B) False

ANSWER : B

138. The largest cross sectional area in the vascular system is at the level of:

- A) Aorta
- B) arterioles
- C)veins
- D) capillaries

ANSWER : D

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139. The resistance offered by all capillaries is the highest in the vascular system.

- A) True
- B) False

ANSWER : B

140. The lymphatic vessels are affected by sympathetic stimulation.

- A) True
- B) False

ANSWER : A

141. Changes in compliance of the veins cause redistribution of blood between

- A) True
- B) False

ANSWER : A

LECTURE 1 AI Q

1. What is the primary reason blood flow to reconditioning organs (e.g., kidneys, digestive system) exceeds their metabolic needs?
 - a) To maintain systemic pressure
 - b) To ensure blood composition remains constant
 - c) To prioritize metabolic activity in these organs
 - d) To compensate for low cardiac output

2. Why is blood flow to the brain prioritized over other organs?
 - a) It can tolerate temporary reductions in blood flow.
 - b) It requires reconditioning of its blood supply.
 - c) A constant and adequate supply is critical to prevent permanent damage.
 - d) It adjusts its blood supply independently based on metabolic activity.

3. What effect does increased blood viscosity have on blood flow rate?
 - a) It increases flow rate due to higher nutrient concentration.
 - b) It decreases flow rate by increasing resistance.
 - c) It does not affect flow rate.
 - d) It decreases resistance, increasing flow rate.

4. Which of the following factors has the most significant impact on vascular resistance?
 - a) Blood viscosity
 - b) Vessel length
 - c) Vessel radius
 - d) Cross-sectional area

5. If the cross-sectional area of vessels increases, what happens to the velocity of blood flow?
 - a) It increases.
 - b) It decreases.
 - c) It remains constant.
 - d) It depends only on blood pressure.

6. Why is blood velocity lowest in capillaries despite their small size?
 - a) The total cross-sectional area of capillaries is larger than the aorta.
 - b) The resistance in capillaries is negligible.
 - c) The capillaries have a higher pressure gradient.
 - d) Blood flow to capillaries is not regulated.

7. What is the relationship between pressure gradient and blood flow rate?
 - a) Blood flow rate is inversely proportional to the pressure gradient.
 - b) Blood flow rate is directly proportional to the pressure gradient.
 - c) Blood flow rate is independent of the pressure gradient.
 - d) Blood flow rate decreases with higher pressure gradients.

8. Which organ is least capable of tolerating disrupted blood flow?
 - a) Skin
 - b) Digestive system
 - c) Kidneys
 - d) Brain

ANSWERS:

1-B

2-C

3-B

4-C

5-B

6-A

7-B

8-D

LECTURE 2 AI Q

1. A patient with severe aortic stenosis has a reduced systolic pressure in the aorta compared to normal. Which of the following compensatory mechanisms ensures adequate blood flow to the capillaries during diastole?

- A) Increased arterial compliance
- B) Increased heart rate
- C) Elastic recoil of the aorta
- D) Sympathetic vasoconstriction of the veins
- E) Increased total peripheral resistance

2. A 50-year-old male with hypertension has a measured Reynolds number of 3000 in his carotid artery. Which of the following factors most likely contributed to the turbulence observed in his blood flow?

- A) Increased blood viscosity
- B) Reduced cardiac output
- C) Narrowing of the vessel diameter
- D) Increased vessel compliance
- E) Decreased blood velocity

3. In systemic circulation, blood flow is distributed through parallel resistances. Which of the following correctly describes the effect of adding an additional resistance (e.g., a new branch)?

- A) Total resistance increases
- B) Mean arterial pressure decreases significantly
- C) Total flow to the system remains constant
- D) Total resistance decreases
- E) There is no effect on total resistance

4. During an experiment, the total resistance of a vascular system arranged in series is measured as 25 mmHg·min/L. If the resistance of one segment is reduced to zero, what will be the new total resistance?

- A) 0 mmHg·min/L
- B) 5 mmHg·min/L
- C) 20 mmHg·min/L
- D) 25 mmHg·min/L
- E) It cannot be determined from the information provided

5. A patient with anemia is noted to have increased cardiac output and a systolic ejection murmur. What is the primary reason for the increased Reynolds number in this patient?

- A) Increased blood viscosity
- B) Increased blood velocity
- C) Decreased blood density

- D) Increased vessel compliance
- E) Increased vascular resistance

6. A researcher measures the pressure across different segments of the vascular system. In which segment is the largest drop in pressure expected, and why?

- A) Large arteries, because of their high flow velocity
- B) Capillaries, because of their small diameter
- C) Arterioles, because they contribute the most to total peripheral resistance
- D) Veins, because of their high compliance
- E) Left ventricle, because of diastolic relaxation

7. A medical student is calculating the mean arterial pressure (MAP) for a patient with a blood pressure of 150/90 mmHg. Using the formula $MAP = DBP + 1/3(PP)$, what is the calculated MAP?

- A) 100 mmHg
- B) 110 mmHg
- C) 120 mmHg
- D) 130 mmHg
- E) 140 mmHg

8. Which of the following changes will most likely increase laminar flow in a blood vessel?

- A) Decreasing the diameter of the blood vessel
- B) Increasing blood viscosity
- C) Increasing the velocity of blood flow
- D) Increasing Reynolds number
- E) Decreasing blood density

9. In a patient with nephrectomy, removal of one kidney increases systemic vascular resistance. What principle explains this phenomenon?

- A) Total resistance in series is the sum of individual resistances
- B) Total resistance in parallel is less than any individual resistance
- C) Increased resistance in capillaries decreases total vascular resistance
- D) Parallel resistances are unaffected by the removal of one branch
- E) Systemic vascular resistance is determined only by arteriolar tone

10. During diastole, arterial blood pressure does not fall to zero due to which property of the arterial system?

- A) High arteriolar resistance
- B) Low capillary compliance
- C) Elastic recoil of the large arteries
- D) Presence of venous valves
- E) Continuous cardiac output during diastole

Answer's:

1. C) Elastic recoil of the aorta The elastic recoil of the aorta maintains blood flow during diastole, ensuring continuous capillary perfusion.

2. C) Narrowing of the vessel diameter A reduced vessel diameter increases blood velocity, which, along with a higher Reynolds number, leads to turbulent flow.

3. D) Total resistance decreases In a parallel arrangement, adding a new resistance decreases total resistance because of the reciprocal summation of individual resistances.

4. C) 20 mmHg·min/L In series resistance, the total resistance is the sum of individual resistances. If one resistance becomes zero, it is subtracted from the total ($25 - 5 = 20$).
5. B) Increased blood velocity In anemia, the heart compensates with increased cardiac output, leading to higher blood velocity and an elevated Reynolds number.
6. C) Arterioles, because they contribute the most to total peripheral resistance Arterioles are the site of greatest pressure drop due to their high resistance in the vascular system.
7. B) 110 mmHg $MAP = DBP + 1/3(PP) = 90 + 1/3(150 - 90) = 90 + 20 = 110$ mmHg.
8. B) Increasing blood viscosity Higher viscosity reduces turbulence, promoting laminar flow by decreasing the Reynolds number.
9. B) Total resistance in parallel is less than any individual resistance In parallel arrangements, removing a branch (e.g., nephrectomy) increases total resistance because fewer pathways are available for blood flow.
10. C) Elastic recoil of the large arteries Elastic arteries store energy during systole and release it during diastole, preventing arterial pressure from falling to zero.

LECTURE 3 AI Q

1. Which of the following factors contributes most significantly to the resistance to blood flow in arterioles?
- A. Length of the vessel
 - B. Radius of the vessel
 - C. Blood viscosity
 - D. Elasticity of the vessel wall

Answer: B. Radius of the vessel

2. What is the primary reason pulse pressure is higher in large arteries compared to the aorta?
- A. Increased compliance of the aorta
 - B. Retrograde pressure waves at arterial branching points
 - C. Greater smooth muscle content in large arteries
 - D. Higher systolic pressure in the capillaries

Answer: B. Retrograde pressure waves at arterial branching points

3. Which of the following factors is responsible for damping of pulse pressure in the capillaries?
- A. Low compliance of capillaries
 - B. Decrease in vascular resistance
 - C. High compliance of capillaries
 - D. High resistance in arterioles

Answer: D. High resistance in arterioles

4. Mean arterial pressure (MAP) is influenced more by which of the following?
- A. Systolic pressure
 - B. Diastolic pressure
 - C. Stroke volume

D. Total peripheral resistance

Answer: B. Diastolic pressure

5. Vascular smooth muscle in arterioles undergoes vasoconstriction in response to stimulation of which receptor?

- A. α 1-Adrenergic**
- B. β 2-Adrenergic**
- C. Muscarinic M2**
- D. Nicotinic N2**

Answer: A. α 1-Adrenergic

Case-Based Questions:

6. Case 1: A 72-year-old male presents with progressively worsening fatigue and difficulty walking. Physical exam reveals a diminished pulse pressure and a systolic murmur at the second right intercostal space. Which of the following changes would most likely be observed in this patient?

- A. Increased stroke volume and compliance**
- B. Decreased systolic pressure with a less prominent dicrotic notch**
- C. Increased diastolic pressure and decreased compliance**
- D. Decreased diastolic pressure with an absent dicrotic notch**

Answer: B. Decreased systolic pressure with a less prominent dicrotic notch (*Aortic stenosis is characterized by reduced stroke volume and a blunted systolic pressure wave.*)

7. Case 2: A 60-year-old female with a history of poorly controlled hypertension presents with a bounding pulse. Physical exam reveals a high-pitched decrescendo diastolic murmur. What is the most likely finding in this patient?

- A. Increased diastolic pressure and decreased stroke volume**
- B. Increased pulse pressure with absent dicrotic notch**
- C. Decreased systolic pressure with a prominent dicrotic notch**
- D. Normal pulse pressure with a continuous blood flow**

Answer: B. Increased pulse pressure with absent dicrotic notch (*Aortic regurgitation causes increased systolic pressure, decreased diastolic pressure, and absence of the dicrotic notch.*)

8. Which of the following is the most likely cause of decreased compliance in arteries?

- A. Increased production of nitric oxide**
- B. Atherosclerosis**
- C. High smooth muscle content**
- D. Increased sympathetic stimulation**

Answer: B. Atherosclerosis

9. What is the primary mechanism by which arterioles control blood flow to capillaries? A.

- Regulation of venous return**
- B. Changes in vessel length**
- C. Adjustment of vessel radius**

D. Recruitment of additional capillaries

Answer: C. Adjustment of vessel radius

10. Which of the following correctly describes the role of vascular tone?

- A. Maintains a baseline level of arteriolar resistance
- B. Reduces cytosolic calcium concentration in smooth muscle
- C. Prevents vasodilation at rest
- D. Is primarily regulated by parasympathetic stimulation

Answer: A. Maintains a baseline level of arteriolar resistance

Mathematical questions for hemodynamics:

Question 1 A 65-year-old male patient has a blood pressure of 130/80 mmHg. What is the mean arterial pressure (MAP)?

- A. 90 mmHg
- B. 96 mmHg
- C. 100 mmHg
- D. 110 mmHg

Correct Answer: B

Explanation: $MAP = DBP + 1/3 PP$. $PP = SBP - DBP = 130 - 80 = 50$ mmHg. $MAP = 80 + (1/3 \times 50) = 80 + 16.7 \approx 96$ mmHg.

Question 2 Which of the following factors has the greatest effect on vascular resistance?

- A. Blood viscosity
- B. Vessel length
- C. Vessel radius
- D. Cardiac output

Correct Answer: C

Explanation: According to the Poiseuille equation, resistance is inversely proportional to the fourth power of the vessel radius, making it the most influential factor.

Question 3 A patient with anemia is found to have increased Reynold's number. Which of the following best explains this finding?

- A. Increased blood viscosity
- B. Decreased blood viscosity
- C. Increased vessel length
- D. Decreased vessel radius

Correct Answer: B

Explanation: Anemia reduces blood viscosity, increasing Reynold's number and the likelihood of turbulent flow.

Question 4 In a system of vessels arranged in series, which of the following is true?

- A. The total resistance is the sum of individual resistances.
- B. The total resistance is less than any individual resistance.

- C. The total resistance is equal to the product of individual resistances.
- D. The pressure increases progressively through the system.

Correct Answer: A

Explanation: In a series arrangement, total resistance equals the sum of the individual resistances.

Question 5 A 45-year-old man is evaluated for increased blood velocity due to a narrowed vessel lumen caused by a thrombus. What is the expected impact on Reynold's number?

- A. Decrease due to reduced flow
- B. Decrease due to reduced viscosity
- C. Increase due to increased velocity
- D. Increase due to increased viscosity

Correct Answer: C

Explanation: Narrowing of the vessel lumen increases blood velocity, which raises Reynold's number, promoting turbulent flow.

Question 6 Which statement correctly describes the effect of parallel vascular arrangement on systemic vascular resistance (SVR)?

- A. SVR increases with the addition of more vessels in parallel.
- B. SVR decreases with the addition of more vessels in parallel.
- C. SVR is independent of the number of vessels in parallel.
- D. SVR is determined only by the resistance of the largest vessel.

Correct Answer: B

Explanation: In parallel vascular arrangements, adding more vessels decreases total resistance.

Question 7 A patient's cardiac output (CO) is 5 L/min, and the pressure gradient between the aorta and the vena cava is 100 mmHg. What is the total peripheral resistance (TPR)?

- A. 0.2 mmHg/L/min
- B. 2 mmHg/L/min
- C. 20 mmHg/L/min
- D. 200 mmHg/L/min

Correct Answer: B

Explanation: $TPR = \Delta P / CO = 100 \text{ mmHg} / 5 \text{ L/min} = 20 \text{ mmHg/L/min}$.

Question 8 If the radius of a blood vessel is halved, how will the resistance change, assuming all other factors remain constant?

- A. It will double.
- B. It will increase by four times.
- C. It will increase by eight times.
- D. It will increase by sixteen times.

Correct Answer: D

Explanation: According to the Poiseuille equation, resistance is inversely proportional to the fourth power of the radius. If the radius is halved, resistance increases by $(1/0.5)^4 = 16$.

Question 9 The velocity of blood flow in a vessel is measured as 10 cm/s, and the cross-sectional area of the vessel is 5 cm². What is the flow rate (Q)?

- A. 2 mL/s
- B. 5 mL/s
- C. 50 mL/s
- D. 500 mL/s

Correct Answer: C

Explanation: $Q = V \times A = 10 \text{ cm/s} \times 5 \text{ cm}^2 = 50 \text{ cm}^3/\text{s} = 50 \text{ mL/s}$.

LECTURE 4 AI Q

1. Which of the following factors most significantly influences the exchange of nutrients and wastes across capillary walls?

- A. Capillary pore size
- B. Bulk flow
- C. Diffusion down concentration gradients
- D. Vesicular transport

Answer: C. Diffusion down concentration gradients

Explanation: Diffusion down concentration gradients is the primary mechanism for exchanging individual solutes across capillary walls, as highlighted in the document.

2. What is the primary function of precapillary sphincters?

- A. Regulation of lymphatic flow
- B. Control of blood flow through specific capillaries
- C. Facilitation of diffusion
- D. Maintenance of plasma protein levels

Answer: B. Control of blood flow through specific capillaries

Explanation: Precapillary sphincters regulate blood flow by contracting or relaxing based on local metabolic activity.

3. Why are plasma proteins typically retained within capillaries?

- A. They are lipid-soluble.
- B. Capillary pores are too small for their passage.
- C. They are actively transported.
- D. They are bound to interstitial fluid molecules.

Answer: B. Capillary pores are too small for their passage.

Explanation: Plasma proteins are large molecules that cannot pass through the water-filled pores of capillary walls.

4. Which of the following is the most important factor regulating vasomotion?

- A. Plasma colloid osmotic pressure
- B. Oxygen concentration in tissues
- C. Capillary pore size
- D. Blood viscosity

Answer: B. Oxygen concentration in tissues

Explanation: Vasomotion is influenced by local oxygen levels, which dictate the opening and closing of precapillary sphincters.

5. What role does the lymphatic system play in maintaining fluid balance?

- A. Directly filters blood plasma**
- B. Reabsorbs excess interstitial fluid**
- C. Prevents capillary hydrostatic pressure**
- D. Enhances plasma protein synthesis**

Answer: B. Reabsorbs excess interstitial fluid

Explanation: The lymphatic system collects and returns excess interstitial fluid to the circulatory system, preventing edema.

6. Why does edema occur in cases of increased capillary permeability?

- A. Plasma colloid osmotic pressure increases.**
- B. More plasma proteins enter the interstitial fluid.**
- C. Capillary hydrostatic pressure decreases.**
- D. Lymphatic flow is enhanced.**

Answer: B. More plasma proteins enter the interstitial fluid.

Explanation: Increased permeability allows plasma proteins to escape into interstitial spaces, reducing oncotic pressure and increasing outward fluid movement.

7. How do fenestrated capillaries differ from typical capillaries?

- A. They lack endothelial cells.**
- B. They have larger pores for rapid fluid exchange.**
- C. They are impermeable to small solutes.**
- D. They are found exclusively in the liver.**

Answer: B. They have larger pores for rapid fluid exchange.

Explanation: Fenestrated capillaries are specialized for rapid fluid exchange, such as in the kidneys and intestines.

8. What is the main driving force for lymphatic flow?

- A. Smooth muscle contractions in lymph vessels**
- B. Arterial blood pressure**
- C. Plasma colloid osmotic pressure**
- D. Capillary hydrostatic pressure**

Answer: A. Smooth muscle contractions in lymph vessels

Explanation: The intrinsic 'lymph pump' relies on rhythmic contractions of lymphatic smooth muscle to propel lymph.

9. In which condition is net filtration pressure positive?

- A. At the venular end of capillaries**
- B. During ultrafiltration at the arteriolar end**
- C. When inward pressures exceed outward pressures**
- D. During reabsorption**

Answer: B. During ultrafiltration at the arteriolar end

Explanation: Net filtration pressure is positive during ultrafiltration, where outward

Lecture: 5

BOOK QUESTION

1* A healthy 27-year-old female medical student runs a 5K race. Which set of physiological changes is most likely to occur in this woman's skeletal muscles during the race?

	Arteriole Diameter	Vascular Conductance	Tissue Oxygen Concentration
A)	↑	↑	↑
B)	↑	↑	↓
C)	↑	↓	↓
D)	↑	↓	↑
E)	↓	↓	↓
F)	↓	↓	↑
G)	↓	↑	↑
H)	↓	↑	↓

Ans: B

2* Cognitive stimuli such as reading, problem solving, and talking all result in significant increases in cerebral blood flow. Which set of changes in cerebral tissue concentrations is the most likely explanation for the increase in cerebral blood flow?

	Carbon Dioxide	pH	Adenosine
A)	↑	↑	↑
B)	↑	↓	↑
C)	↑	↓	↓
D)	↑	↑	↓
E)	↓	↓	↓
F)	↓	↑	↓
G)	↓	↑	↑
H)	↓	↓	↑

Ans: B

3* An increase in shear stress

- A) Decreased endothelin production
- B) Decreased cyclic guanosine monophosphate production
- C) Increased nitric oxide release
- D) Increased renin production
- E) Decreased prostacyclin production

Ans: C

4* 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

Ans: E

5* 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

Ans: C

6* 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

Ans: D

Ans: D

7* A 72-year-old man had surgery to remove an abdominal tumor. Pathohistological studies revealed that the tumor mass contained a large number of vessels. he most likely stimulus for the growth of vessels in a solid tumor is an increase in which of the following?

- A) Growth hormone
- B) Plasma glucose concentration
- C) Angiostatin growth factor
- D) Vascular endothelial growth factor
- E) Tissue oxygen concentration

Ans: D

8* While participating in a cardiovascular physiology laboratory, a medical student isolates an animal's carotid artery proximal to the carotid bifurcation and partially constricts the artery with a tie around the vessel. Which set of changes would be expected to occur in response to constriction of the carotid artery?

	Heart Rate	Sympathetic Nerve Activity	Total Peripheral Resistance
A)	↑	↑	↑
B)	↑	↑	↓
C)	↑	↓	↓
D)	↑	↓	↑
E)	↓	↓	↓
F)	↓	↓	↑
G)	↓	↑	↑
H)	↓	↑	↓

Ans: A

9* While participating in a cardiovascular physiology laboratory, a medical student isolates the carotid artery of an animal and partially constricts the artery with a tie around the vessel. Which set of changes would be expected to occur in response to constriction of the carotid artery?

	Sympathetic Nerve Activity	Renal Blood Flow	Total Peripheral Resistance
A)	↑	↑	↑
B)	↑	↓	↑
C)	↑	↓	↓
D)	↑	↑	↓
E)	↓	↓	↓
F)	↓	↑	↓
G)	↓	↑	↑
H)	↓	↓	↑

Ans: B

10* A 22-year-old man enters the hospital emergency department after severing a major artery in a motorcycle accident. It is estimated that he has lost approximately 700 milliliters of blood. His blood pressure is 90/55 mm Hg. Which set of changes would be expected in response to hemorrhage in this man?

	Heart Rate	Sympathetic Nerve Activity	Total Peripheral Resistance
A)	↑	↑	↑
B)	↑	↓	↑
C)	↑	↓	↓
D)	↑	↑	↓
E)	↓	↓	↓
F)	↓	↑	↓
G)	↓	↑	↑
H)	↓	↓	↑

Ans: A

11* 2. Which condition normally causes arteriolar vasodilation during exercise?

- A) Decreased plasma potassium ion concentration
- B) Increased histamine release
- C) Decreased plasma nitric oxide concentration
- D) Increased plasma adenosine concentration
- E) Decreased plasma osmolality

Ans:D

Ans: D

12* Release of which substance causes vasodilation and increased capillary permeability during anaphylactic shock?

- A) Histamine
- B) Bradykinin
- C) Nitric oxide
- D) Atrial natriuretic factor
- E) Adenosine

Ans: A

* Anaphylactic shock “ allergic reaction “

Q20:

13* Which of the following is a vasoconstrictor?

Ans : endothelin

14* A patient has an AV fistula from the radial artery to the antecubital vein to permit vascular access for dialysis, what occurs to the venous side?

- A) Outward remodeling
- B) Outward hypertrophic remodeling
- C) Hypertrophic remodeling
- D) Inward eutrophic remodeling

Ans: B

15* Which of the following is true regarding local control of tissue blood flow?

- A) Reactive hyperemia is when a tissue becomes highly active, such as an exercising muscle so the rate of blood flow through the tissue increases
- B) Active hyperemia is When the blood supply to a tissue is blocked for a few seconds to hours then is unblocked, blood flow through the tissue usually increases immediately
- C) Angiogenesis is stimulated by increased metabolic requirements and tissue hypoxia

D) Ans: C

AI QUESTION

1. Which of the following is the primary function of arterioles in regulating blood flow?

- A. Nutrient absorption
- B. Oxygen exchange
- C. Resistance control
- D. Hormone secretion

Answer: C. Resistance control

2. During exercise, increased levels of which substances lead to vasodilation in skeletal muscles?

- A. Oxygen and glucose
- B. Carbon dioxide and hydrogen ions

- C. Sodium and potassium
- D. Calcium and ATP

Answer: B. Carbon dioxide and hydrogen ions

3. What process describes increased blood flow following the release of a blood vessel blockage?

- A. Active hyperemia
- B. Reactive hyperemia
- C. Autoregulation
- D. Long-term control

Answer: B. Reactive hyperemia

4. Which mechanism is primarily responsible for maintaining stable blood flow despite fluctuating blood pressure?

- A. Vasodilation of capillaries
- B. Autoregulation
- C. Neural control
- D. Endothelial remodeling

Answer: B. Autoregulation

5. A patient on nitroglycerin for angina experiences relief due to which of the following mechanisms?

- A. Increased cardiac output
- B. Vasodilation mediated by nitric oxide
- C. Enhanced blood viscosity
- D. Reduction of vasoconstrictor hormones

Answer: B. Vasodilation mediated by nitric oxide

6. Which of the following describes the main theory behind metabolic control of acute blood flow regulation?

- A. Elevated tissue metabolism reduces vasodilator levels.
- B. Increased metabolic activity produces vasodilators that relax arterioles.
- C. Decreased tissue oxygen increases arterial wall contraction.

- D. Increased capillary pressure closes precapillary sphincters.

Answer: B. Increased metabolic activity produces vasodilators that relax arterioles.

7. Question What is the most significant clinical risk when excessive oxygen is provided to a premature baby in an incubator?

- A. Stroke
- B. Blindness
- C. Pulmonary edema
- D. Renal failure

Answer: B. Blindness

8. Angiotensin II raises blood pressure primarily by:

- A. Increasing heart rate
- B. Increasing total peripheral resistance
- C. Enhancing sodium excretion
- D. Reducing cardiac preload

Answer: B. Increasing total peripheral resistance

9. Histamine release in inflamed tissues results in which of the following?

- A. Increased vascular resistance
- B. Capillary leakage and edema
- C. Reduced cardiac output
- D. Smooth muscle contraction

Answer: B. Capillary leakage and edema

10. Which of the following best describes “inward eutrophic remodeling”?

- A. Increased vessel wall thickness with unchanged lumen diameter
- B. Decreased lumen diameter with no change in wall thickness
- C. Increased cross-sectional area and wall tension
- D. Vessel wall hypertrophy with reduced elasticity

Answer: B. Decreased lumen diameter with no change in wall thickness

LECTURE:6

BOOK QUESTIONS

1* A healthy 60-year-old woman with a 10-year history of hypertension stands up from a supine position. Which set of cardiovascular changes is most likely to occur in response to standing up from a supine position?

	Sympathetic Nerve Activity	Parasympathetic Nerve Activity	Heart Rate
A)	↑	↑	↑
B)	↑	↑	↓
C)	↑	↓	↓
D)	↑	↓	↑
E)	↓	↓	↓
F)	↓	↓	↑
G)	↓	↑	↑
H)	↓	↑	↓

Ans: D

2* 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

Ans: D

3* A 60-year-old woman has experienced dizziness for the past 6 months when getting out of bed in the morning and when standing up. Her mean arterial pressure is 130/90 mm Hg while lying down and 95/60 while sitting. Which set of physiological changes would be expected in response to moving from a supine to an upright position?

	Parasympathetic Nerve Activity	Plasma Renin Activity	Sympathetic Activity
A)	↑	↑	↑
B)	↑	↓	↑
C)	↑	↓	↓
D)	↑	↑	↓
E)	↓	↓	↓
F)	↓	↑	↓
G)	↓	↑	↑
H)	↓	↓	↑

Ans: G

4* A 65-year-old man with a 10-year history of essential hypertension is being treated with an angiotensin- converting enzyme (ACE) inhibitor. Which set of changes would be expected to occur in response to the ACE inhibitor drug therapy?

	Plasma Renin Concentration	Total Peripheral Resistance	Renal Sodium Excretory Function
A)	↑	↑	↑
B)	↑	↑	↓
C)	↑	↓	↓
D)	↑	↓	↑
E)	↓	↓	↓
F)	↓	↓	↑
G)	↓	↑	↑
H)	↓	↑	↓

Ans: D

5* A 55-year-old man with a history of normal health visits his physician for a checkup. The physical examination reveals that his blood pressure is 170/98 mm Hg. Further tests indicate that he has renovascular hypertension as a result of stenosis in the left kidney. Which set of findings would be expected in this man with renovascular hypertension?

	Total Peripheral Resistance	Plasma Renin Activity	Plasma Aldosterone Concentration
A)	↑	↑	↑
B)	↑	↓	↑
C)	↑	↓	↓
D)	↑	↑	↓
E)	↓	↓	↓
F)	↓	↑	↓
G)	↓	↑	↑
H)	↓	↓	↑

Ans: A

6* A 50-year-old man has a 3-year history of hypertension. He reports fatigue and occasional muscle cramps. here is no family history of hypertension. he patient has not had any other significant medical problems in the past. Examination reveals a blood pressure of 168/104 mm Hg. Additional laboratory tests indicate that the patient has primary hyperaldosteronism. Which set of findings would be expected in this man with primary hyperaldosteronism hypertension?

	Extracellular Fluid Volume	Plasma Renin Activity	Plasma Potassium Concentration
A)	↑	↑	↑
B)	↑	↓	↑
C)	↑	↓	↓
D)	↑	↑	↓
E)	↓	↓	↓
F)	↓	↑	↓
G)	↓	↑	↑
H)	↓	↓	↑

Ans: C

7* An ACE inhibitor is administered to a 65-year-old man with a 20-year history of hypertension. he drug lowered his arterial pressure and increased his plasma levels of renin and bradykinin. Which mechanism would best explain the decrease in arterial pressure?

- A) Inhibition of angiotensin I
- B) Decreased conversion of angiotensinogen to angiotensin I
- C) Increased plasma levels of bradykinin
- D) Increased plasma levels of renin
- E) Decreased formation of angiotensin II

Ans: E

8* A balloon catheter is advanced from the superior vena cava into the heart and inflated to increase atrial pressure by 5 mm Hg. An increase in which of the following would be expected to occur in response to the elevated atrial pressure?

- A) Atrial natriuretic peptide
- B) Angiotensin II
- C) Aldosterone
- D) Renal sympathetic nerve activity

Ans: A

9* Histamine is infused into the brachial artery. Which set of microcirculatory changes would be expected in the infused arm?

	Capillary Water Permeability	Capillary Hydrostatic Pressure	Capillary Filtration Rate
A)	↑	↑	↑
B)	↑	↑	↓
C)	↑	↓	↓
D)	↑	↓	↑
E)	↓	↓	↓
F)	↓	↓	↑
G)	↓	↑	↑
H)	↓	↑	↓

Ans: A

AI QUESTIONS

1:

A 65-year-old man with a history of hypertension presents to the clinic for a follow-up. His blood pressure reading is 170/100 mmHg. Which of the following best explains why his baroreceptor reflex fails to adequately lower his blood pressure?

- A) Baroreceptors are insensitive to changes in blood pressure above 100 mmHg.
- B) Baroreceptors adapt to sustained high blood pressure over time.
- C) Baroreceptor sensitivity is inhibited by sympathetic activation.
- D) Baroreceptors only function during rapid decreases in blood pressure.

Correct Answer: B

Question 2:

A patient with acute hemorrhage develops a sudden drop in blood pressure. Which of the following mechanisms will occur first to compensate for the drop in blood pressure?

- A) Activation of the renin-angiotensin-aldosterone system

(RAAS).

B) Increased baroreceptor firing.

**C) Increased sympathetic
outflow.**

**D) Secretion of atrial natriuretic
peptide.**

Correct Answer: C

Question 3:

**Baroreceptors in the carotid
sinus send afferent signals to the
medulla via which of the
following cranial nerves?**

A) Vagus nerve (CN X).

**B) Glossopharyngeal nerve (CN
IX).**

C) Hypoglossal nerve (CN XII).

D) Trigeminal nerve (CN V).

Correct Answer: B

Question 4:

**A patient standing up suddenly
after lying down experiences a
brief episode of lightheadedness.
Which physiological mechanism
most likely prevents fainting in
this scenario?**

**A) Activation of chemoreceptors
in the carotid bodies.**

B) Stimulation of low-pressure

receptors in the atria.

C) Baroreceptor-mediated

increase in sympathetic tone.

D) Myogenic vasodilation in

cerebral vessels.

Correct Answer: C

Question 5:

The brainstem plays a central role in blood pressure regulation.

Which of the following structures integrates afferent signals from baroreceptors to maintain homeostasis?

A) Nucleus tractus solitarius.

B) Hypothalamus.

C) Locus coeruleus.

D) Periaqueductal gray.

Correct Answer: A

Question 6:

During sympathetic stimulation, which of the following vascular beds is least responsive to vasoconstriction?

A) Renal arteries.

B) Cerebral arteries.

C) Gastrointestinal arteries.

D) Cutaneous arteries.

Correct Answer: B

Question 7:

A patient has chronic hypertension. What is the primary reason the baroreceptor reflex is ineffective in long-term blood pressure regulation?

- A) It is overridden by local vasodilatory mechanisms.**
- B) It resets to a higher baseline pressure.**
- C) It is inhibited by parasympathetic activation.**
- D) It loses sensitivity to arterial stretch over time.**

Correct Answer: B

Question 8:

Which of the following best describes the function of low-pressure receptors located in the atria and pulmonary arteries?

- A) They regulate systemic vascular resistance.**
- B) They respond to changes in blood volume.**
- C) They mediate vasoconstriction during hypoxia.**
- D) They are sensitive to rapid changes in arterial pressure.**

Correct Answer: B

LECTURE 7AI Q

Question 1

A patient loses 20% of their total blood volume in an accident. Despite this, the circulatory system functions almost normally. Which of the following explains this phenomenon?

- A) Increased arteriolar vasoconstriction**
- B) The veins acting as a blood reservoir**
- C) Increased cardiac suction effect**
- D) Enhanced skeletal muscle pump activity**

Answer: B The veins' capacity to act as a blood reservoir compensates for the loss of blood volume by releasing stored blood into circulation.

Question 2

Venous vasoconstriction is induced by sympathetic stimulation. Which of the following best explains its effect on venous return?

- A) Increases resistance, reducing venous flow**
- B) Reduces venous capacity, enhancing return to the heart**
- C) Increases pressure in capillaries, causing edema**
- D) Causes blood pooling in the lower limbs**

Answer: B Venous vasoconstriction reduces venous capacity, which squeezes blood toward the heart, enhancing venous return.

Question 3

A patient with varicose veins experiences chronic edema in their legs. What is the primary cause of this condition?

- A) Increased venous valve efficiency**
- B) Failure of the venous pump**
- C) Increased sympathetic stimulation**
- D) Reduced capillary hydrostatic pressure**

Answer: B The failure of the venous pump due to incompetent venous valves leads to increased pressure and fluid leakage, causing edema.

Question 4

A patient stands perfectly still for 30 minutes. Which physiological change is most likely to occur?

- A) Increased venous return to the heart**
- B) Reduced capillary filtration**
- C) Increased venous pressure in the legs**
- D) Enhanced skeletal muscle pump activity**

Answer: C Standing still increases venous pressure in the legs due to gravitational effects, leading to fluid leakage and potential swelling.

Question 5

Which of the following mechanisms does NOT contribute to enhancing venous

return during exercise?

- A) Increased respiratory activity
- B) Decreased venous valve efficiency
- C) Enhanced skeletal muscle pump
- D) Sympathetically induced venous vasoconstriction

Answer: B **Decreased venous valve efficiency would reduce venous return by allowing backflow of blood.**

Question 6

Arteriolar vasoconstriction differs from venous vasoconstriction in that it:

- A) Reduces flow due to increased resistance
- B) Increases venous return to the heart
- C) Enhances the storage capacity of veins
- D) Reduces capillary pressure

Answer: A **Arteriolar vasoconstriction increases resistance, reducing flow through these vessels.**

Question 7

Which of the following best describes the respiratory pump's role in venous return?

- A) Increasing arterial pressure
- B) Enhancing the skeletal muscle pump
- C) Creating a pressure gradient between the lower veins and chest veins
- D) Reducing cardiac suction effect

Answer: C **The respiratory pump creates a pressure gradient due to lower pressure in the chest cavity compared to atmospheric pressure, promoting venous return.**

Question 8

What happens to venous return when right atrial pressure increases significantly?

- A) Venous return increases due to enhanced pressure gradient
- B) Venous return decreases due to reduced pressure gradient
- C) Venous return remains unchanged due to valve function
- D) Venous return increases due to sympathetic stimulation

Answer: B **Increased right atrial pressure reduces the pressure gradient driving venous return, leading to a decrease.**

Question 9

What is the effect of positive inotropic agents on the venous return curve?

- A) Shifts the venous return curve upward
- B) Shifts the venous return curve downward
- C) Does not change the venous return curve
- D) Decreases mean systemic pressure

Answer: C **Positive inotropic agents affect the cardiac function curve but do not directly alter the venous return curve.**

Question 10

Which of the following compensatory mechanisms helps maintain cardiac output when moving from a lying to a standing position?

- A) Increased venous compliance**
- B) Reduced mean systemic pressure**
- C) Sympathetically induced venous vasoconstriction**
- D) Decreased skeletal muscle pump activity**

Answer: C