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# *Microcirculation*

*65-year-old man has a 20-year history of nephrotic syndrome (kidney disease). He visits his physician complaining of swelling of his extremities. A decrease in which of the following is one of the most likely cause of his lower limb edema?*

- a. Arteriole conductance*
- b. Interstitial hydrostatic pressure*
- c. Plasma colloid osmotic pressure*
- d. Capillary hydrostatic pressure*
- e. Interstitial colloid osmotic pressure*

*Answer:C*

*Listed below are the hydrostatic and oncotic pressures across a muscle capillary wall. Mean capillary hydrostatic pressure = 25 mmHg. Plasma colloid osmotic pressure = 28 mmHg. Interstitial colloid osmotic pressure = 5 mmHg. Interstitial hydrostatic pressure = -5 mmHg. What is the net filtration pressure (in mmHg) for fluid movement across the capillary wall?*

- a. Cannot be calculated.*
- b. 7 mmHg toward reabsorption*
- c. 7 mmHg toward filtration*
- d. 3 mmHg toward filtration*
- e. 3 mmHg toward reabsorption*

*Answer:C*

*Edema at interstitial fluids can be generated by all the following EXCEPT :*

- a. Increased hydrostatic pressure in capillaries.*
- b. Decreased lymph flow from interstitial fluids.*
- c. Decreased albumin concentration in plasma.*
- d. Increased wash down of protein from interstitial fluid*
- e. Increased venous pressure.*

*Answer:D*

*The net loss of fluid from capillaries to the interstitial fluid in the legs is decreased by:*

- a. Decrease plasma albumin.*
- b. Lymphatic obstruction and increased interstitial hydrostatic pressure.*
- c. Arteriolar dilation to increase capillary pressure.*
- d. Change from the recumbent to the standing position*
- e. Leg exercise and capillary hydrostatic pressure*

*Answer: B*

*Which of the following pairs are NOT related to each other ?*

*a. Negative pressure ranges in interstitial fluids and Low tissue compliance*

*b. Increased capillary permeability and Generation of edema.*

*c. Increased colloid pressure in capillaries and Development of edema.*

*d. Increased lymph drainage and Wash down of proteins in interstitial fluid.*

*e. Hydrostatic pressure in arterial end of capillaries and Filtration*

*Answer:E*

*Listed below are the hydrostatic and oncotic pressure across a muscle capillary wall.*

*Mean capillary hydrostatic pressure=30 mmHg*

*Plasma colloid osmotic pressure= 25 mmHg*

*Interstitial colloid osmotic pressure=10 mmHg*

*Interstitial hydrostatic pressure=5 mmHg*

*What is the net filtration pressure (in mmHg) for fluid movement across the capillary wall?*

*A-25 mmHg B-0 mmHg*

*C-5 mmHg D-15 mmHg*

*E-10 mmHg*

*Answer:E*



*The net filtration rate is?*

*knowing that:-*

*capillary hydrostatic pressure is = 25 mmhg,*

*interstitial hydrostatic pressure is = 25 mmhg,*

*capillary oncotic pressure is = 5 mmhg, interstitial*

*oncotic pressure is = 5 mmhg, filtration coefficient = 10.*

*A) 5 ml/m.*

*B) 10 ml/m.*

*C) 0 ml/m.*

*D) 40 ml/m*

*E) 400 ml/m.*

*Answer:C*

*Patient with varicose veins standing on his legs for a long time can cause?*

*A) Increase reabsorption, decrease filtration, cause edema.*

*B) Increase reabsorption, decrease blood pressure, cause edema.*

*C) Decrease reabsorption, increase filtration, cause edema.*

*D) Increase reabsorption, decrease filtration, normal ECF volume.*

*E) None of the above is true.*

*Answer:C*

*Which of the following statements is correct regarding acute and long-term autoregulation of local circulation?*

*A) Long-term autoregulation of tissue blood flow is more efficient than acute autoregulation in keeping tissue blood flow constant*

*B) Long-term autoregulation occurs transiently by either release of vasodilator or vasoconstrictor factors from tissues*

*C) Long-term autoregulation occurs transiently due to the myogenic response of arterioles*

*D) Acute term autoregulation occurs after the release of angiogenic factors*

*Answer:A*

*Which of the following is the largest contributor to the plasma oncotic pressure?*

- a. Small molecules (e.g., glucose, amino acids, vitamins, etc)*
- b. Red blood cells and white blood cells*
- c. Large proteins found in plasma (e.g., albumin and globulins)*
- d. Cations and anions in plasma*
- e. Fibrinogen*

*Answer:C*

*A decrease in plasma colloid osmotic pressure would lead to:*

*a) Increased fluid reabsorption into the capillaries*

*b) Increased fluid filtration into the interstitium*

*c) No change in fluid movement across the capillary walls*

*d) Decreased fluid movement in both directions across the capillary walls*

*Answer: b*

*The term "capillary hydrostatic pressure" refers to the pressure exerted by:*

- a) Blood plasma within the capillary lumen*
- b) Interstitial fluid surrounding the capillary*
- c) Blood cells flowing through the capillary*
- d) Hydrostatic pressure in the arterioles*

*Answer: a*

*Which of the following forces opposes the movement of fluid out of the capillaries?*

- a) Hydrostatic pressure*
- b) Colloid osmotic pressure*
- c) Interstitial pressure*
- d) Osmotic pressure of interstitial fluid*

*Answer: b*

*The difference between the capillary hydrostatic pressure and the interstitial fluid hydrostatic pressure is known as the:*

- a) Net filtration pressure*
- b) Net osmotic pressure*
- c) Net reabsorption pressure*
- d) Net hydrostatic pressure*

*Answer: a*



*The lymphatic system helps prevent the accumulation of excess fluid in the interstitium by:*

*a) Contracting smooth muscles to push fluid back into the capillaries*

*b) Increasing hydrostatic pressure within the interstitium*

*c) Activating osmoreceptors to decrease capillary permeability*

*d) Absorbing and transporting excess fluid and proteins away from the tissue*

*Answer: d*

*The balance between hydrostatic pressure and colloid osmotic pressure determines the:*

- a) Distribution of fluid between the intracellular and extracellular compartments*
- b) Movement of fluid between the plasma and interstitial compartments*
- c) Rate of blood flow through the microcirculation*
- d) Oxygen-carrying capacity of red blood cells*

*Answer: B*

# *Neurophysiology*

*Receptors that respond when a stimulus is first applied, but continues to apprise the brain about the sensation is called?*

- a. Phasic receptors*
- b. Nociceptors*
- c. Exteroceptors*
- d. Tonic receptors*
- e. None of the above*

*Answer:D*

*Intensity discrimination is better the :*

*a. The unmyelinated neurons activated.*

*b. Shape of receptor*

*c. Decreased number of receptors activated.*

*d. Greater amplitude of action potential*

*e. Higher frequency of action potential*

*Answer:E*

*Localisation of sensation is made by :*

*a. Shape of receptor*

*b. Greater amplitude of action potential*

*c. The sensory pathway ending at specific area in the brain.*

*d. Type of receptor*

*e. Number of sensory neurons activated.*

**A:C**

*In sensory receptors:*

- a. Stimulus energy is converted into local depolarisation.*
- b. Serving touch sensation, constant suprathreshold stimulation causes an action potential to be generated at a constant rate.*
- c. The frequency of action potential generated doubles when the strength of the stimulus doubles*
- d. A generator (receptor) potential can be produced by only one form of energy.*
- e. The generator (receptor) is graded, self-propagating.*

*Answer:A*

*All of these receptors are skin receptors  
EXCEPT :*

- a. Ruffini endings*
- b. Golgi tendon*
- c. Naked free nerve endings*
- d. Pacinian corpuscle*
- e. Merkel's discs*

*Answer: B*



*The progressive decline in a synaptic transmission with repetitive stimulation is due to:*

- a. The up regulation of the receptors*
- b. The synaptic delay*
- c. The diffusion of the transmitters across the synaptic cleft*
- d. Depletion of the stored neurotransmitters*
- e. The high pH of the blood*

*Answer:D*

*The most important effect of lateral inhibition is to*

- a. Allow for stimulus intensity to be encoded in the firing frequency of a neuron.*
- b. Enable two points of skin contact to be felt separately rather than as one.*
- c. Sharpen perception of the precise location of a stimulus.*
- d. Increase the signal time of perception.*
- e. Enable the brain to distinguish between one sensory modality and another.*

*Answer:C*

*Receptor (Generator) potential :*

*a. Generated in the node of Ranvier only.*

*b. Local response*

*c. Propagated*

*d. Occur in myelinated nerve.*

*Answer: B*

*Which of the following types of neuronal circuits is self-stimulating once activated?*

*a. Diverging*

*b. One that incorporates lateral inhibition.*

*c. Converging*

*d. Reverberating*

*e. Negative feedback circuit (corticothalamic)*

*Answer:D*

*The area of the motor cortex that is devoted to a particular region of the body is proportional to the*

- a. Distance of the body are from the brain.*
- b. Number of sensory receptors in the area of the body*
- c. Size of the nerves that serve the area of the body.*
- d. Size of the body area*
- e. Number of motor units in that region*

*Answer:B*

*Which of the following statements concerning autonomic nervous system is TRUE:*

- a. In the synaptic organization, more divergence and convergence are found in parasympathetic system than in sympathetic.*
- b. Norepinephrine is secreted by preganglionic neurons of sympathetic.*
- c. Smooth muscle cells of blood vessels are controlled directly only by sympathetic.*
- d. Parasympathetic fibres that originate in the brain are under the voluntary control.*
- e. Sympathetic fibres that innervate suprarenal glands are releasing*

*Answer:C*

*The type of signalling when the cell that secretes the signal is also the target is called:*

- a. Contact-dependent*
- b. Endocrine*
- c. Paracrine*
- d. Autocrine*
- e. Synaptic*

*Answer:D*

*Pain receptors in the skin are typically classified as which of the following?*

*A) Encapsulated nerve endings*

*B) A single class of morphologically specialized receptors*

*C) The same type of receptor that detects position sense*

*D) Free nerve endings*

*Answer:D*



*Which of the following best describes an expanded tip) tactile receptor found in the dermis of hairy skin that is specialized to detect continuously applied touch sensation?*

*A) Free nerve endings*

*B) Merkel disc*

*C) Pacinian corpuscle*

*D) Ruffini endings*

*Answer:D*

*Which of the following is best described as an elongated, encapsulated receptor found in the dermal pegs of glabrous skin that is especially abundant on lips and fingertips?*

*A) Merkel disc*

*B) Free nerve endings*

*C) Meissner corpuscle*

*D) Ruffini endings*

*Answer:C*

*Which of the following best describes the concept of specificity in sensory nerve fibers that transmit only one modality of sensation?*

- A) Frequency coding principle*
- B) Concept of specific nerve energy*
- C) Singularity principle*
- D) Labeled line principle*

*Answer:D*

*Which of the following is an encapsulated receptor found deep in the skin throughout the body, as well as in fascial layers, where it detects indentation of the skin (pressure) and movement across the surface (vibration)?*

- A) Pacinian corpuscle*
- B) Meissner's corpuscle*
- C) Free nerve endings*
- D) Ruffini endings*

*Answer:A*

*The excitatory or inhibitory action of a neurotransmitter is determined by which of the following?*

*A) The function of its postsynaptic receptor*

*B) Its molecular composition*

*C) The shape of the synaptic vesicle in which it is contained*

*D) The distance between the pre- and postsynaptic*

*E) membranes*

*Answer:A*

*)we don't need all the receptors to be bound to their signals to have a high physiological response.*

*A>true*

*B>false.*

*Answer: true*

*Local anesthetic drugs like curare take effect by which of the following mechanisms:*

- A) Blocking nicotinic acetylcholine receptors at the synapse*
- B) Inhibiting the action of acetylcholinesterase in the synapse*
- C) Internal block of axonal voltagegated sodium channels*
- D) Blocking neurotransmitter uptake by axonal terminals*
- E) Inhibiting the propagation of the action potential through autonomic neurons*

*Answer:A*

*Which type of neuronal pool circuits is important in well localized sharp sensation:*

- A) Convergence of neurons*
- B) Reverberatory circuits*
- C) Divergence of neurons*
- D) Lateral inhibitory circuits*
- E) Parallel circuits*

*Answer:D*



*In the back the two-points discrimination is larger than on the fingertips because?*

*A) The excitability of the receptors from back is greater*

*B) The cortical space specified for sensory reception from the back is smaller*

*C) The receptive field in the back is smaller*

*D) The density of receptors in the back is greater*

*E) The discharge rate from the afferents from the back is greater*

*Answer: B*

*Which of the following receptors do not exhibit adaptation:*

*A) pain receptors*

*B) pressure*

*C) receptors receptors touch*

*D) smell receptors*

*Answer:A*

*Muscranic recepoters activate by :*

*A) ACH*

*B) dopamnine*

*C) glutamate*

*Answer:A*

*A wide variety of neurotransmitters have been identified in the cell bodies and afferent synaptic terminals in the basal ganglia. A deficiency of which transmitter is typically associated with Parkinson's disease?*

*A) Norepinephrine*

*B) Dopamine*

*C) Serotonin*

*D) GABA*

*E) Substance P*

*Answer: B*

*One of the following is an excitatory neurotransmitter:*

- a) Acetylcholine*
- b) Dopamine*
- c) Glycine*
- d) GABA*
- e) NO*

*Answer:A*

*One of the following is responsible for the reflexes:*

- a) Cortex*
- b) Spinal cord*
- c) Cerebrum*
- d) Lower brain*
- e) All of the above*

*Answer: B*

*Which of the following is true about after-discharge:*

*a) Parallel after-discharge is longer than reverberating after-discharge*

*b) Reverberating after-discharge can't be facilitated*

*c) They can get fatigued*

*d) They are highly regenerated*

*e) All of them*

*Answer:C*

*One of the following is TRUE:*

*a) In Convergence, the input signal spreads to an increasing number of neurons*

*b) Divergence can act only on the same track*

*c) Divergence means that multiple inputs are gathered together in a single neuron*

*d) In convergence, the excitation will be on a single neuron*

*e) Both C & D*

*Answer:D*



*Action potential occurs in axon hillock because:*

*a) It's a connection between the cell body and axon*

*b) It has no  $\text{Ca}^{2+}$  channels*

*c) It has many  $\text{Na}^{+}$  channels*

*d) Its permeability for anions(negative charges ions) is high*

*e) It has no  $\text{K}^{+}$  channels*

*Answer:C*

*A patient comes to you with seizures you expect that he has:*

- a) Hypoxia*
- b) Acidosis*
- c) Alkalosis*
- d) A huge number of neurotransmitters in the cleft*
- e) Fatigue in synapse*

*ANSWER:C*

*What is the role of serotonin in the spinal cord?*

- a) Excitation of pain pathways*
- b) Inhibition of pain pathways*
- c) Regulation of motor function*
- d) Control of temperature regulation*

*Answer: B*

*Dopamine is primarily secreted by neurons originating from which brain region?*

- a) Locus coeruleus*
- b) Periaqueductal gray*
- c) Substantia nigra*
- d) Median raphe*

*Answer:C*

*What is the typical effect of dopamine in the nervous system?*

*a) Excitation*

*b) Inhibition*

*c) Modulation of sensory perception*

*d) Regulation of autonomic functions*

*Answer: B*

*Norepinephrine is primarily secreted by the terminals of neurons located in which regions of the brain?*

- a) Cerebral cortex and hippocampus*
- b) Frontal lobe and parietal lobe*
- c) Brain stem and hypothalamus*
- d) Basal ganglia and thalamus*

*Answer:C*

# *Body fluids*

*After giving a person healthy intravenous saline solution (isotonic NaCl), the properties of extracellular fluid will be ?*

- a. Hypertonic and hypervolemic*
- b. Isotonic and normovolemic*
- c. Isotonic and hypervolemic*
- d. Hypotonic and hypervolemic*
- e. Hypotonic and normovolemic*

*Answer : C*



*A 65-year-old man has a 20 years history of nephrotic syndrome -(kidney disease). He visits his physician complaining of swelling of his extremities. A decrease in which of the following is one of the most likely cause of his lower limb edema?*

- a. Arteriole conductance*
- b. Interstitial hydrostatic pressure*
- c. Plasma colloid osmotic pressure*
- d. Capillary hydrostatic pressure*
- e. Interstitial colloid osmotic pressure*

*Answer : C*

*Which of the following pairs are NOT having similar effects on Na<sup>+</sup> level of body fluids:*

- a. Increased ADH secretion and drinking of high amounts of portable (normal) water.*
- b. High release of aldosterone and ingestion of high amounts of salts*
- c. Hypoaldosteronism (decreased aldosterone secretion) and deficiency of ADH*
- d. Loss of hypotonic fluids from the body and activation of renin- angiotensinaldosterone system*
- e. High release of ANP (atrial natriuretic peptide) and intravenous infusion of hypotonic solution*

*Answer:C*

*With regard to measurements of body fluids, which of the following is TRUE:*

- a.  $^{51}\text{Cr}$ -labeled RBCs can be used for measuring total blood volume.*
- b.  $^{40}\text{K}^+$  radioisotope is used for measuring intracellular fluid volume.*
- c. Insulin is used to measure intravascular fluid volume.*
- d.  $^{125}\text{I}$ -albumin is used to measure interstitial fluids volume.*
- e.  $^{22}\text{Na}^+$  radioisotope is used to measure total body fluids.*

*Answer : A*

*The net loss of fluid from capillaries to the interstitial fluid in the legs is decreased*

*by:*

*a. Decrease plasma albumin.*

*b. Lymphatic obstruction and increased interstitial hydrostatic pressure.*

*c. Arteriolar dilation to increase capillary pressure.*

*d. Change from the recumbent to the standing position*

*e. Leg exercise and capillary hydrostatic pressure*

*Answer:B*

*Which of the following is NOT true with regard to body fluids ?*

- a. Higher Na<sup>+</sup> concentration in extracellular than in intracellular fluid*
- b. Higher oncotic pressure is in interstitial fluids than inside vessels.*
- c. Both extracellular and intracellular fluids are having isotonic environment*
- d. Higher protein content inside cells than in plasma*
- e. Almost the same concentration of Na<sup>+</sup> is found in plasma and interstitial fluids.*

*Answer: B*

*Which of the following conditions results in increasing volume and decreasing osmolarity of extracellular body fluids?*

- a. High release of ANP (atrial natriuretic peptide)*
- b. High use of diuretics*
- c. High release of ADH*
- d. Activation of renin-angiotensin-aldosterone system*
- e. Drinking of salty water*

*Answer : C*

*Which of the following pairs are NOT related to each other ?*

- a. Negative pressure ranges in interstitial fluids and Low tissue compliance*
- b. Increased capillary permeability and Generation of edema.*
- c. Increased colloid pressure in capillaries and Development of edema.*
- d. Increased lymph drainage and Wash down of proteins in interstitial fluid.*
- e. Hydrostatic pressure in arterial end of capillaries and Filtration*

*Answer : C*

*Which of the following substances or combinations of substances could be used to measure interstitial fluid volume?*

*(A) Mannitol*

*(B) D2O alone*

*(C) Evans blue*

*(D) Inulin and D2O*

*(E) Inulin and radioactive albumin*

*Answer: E*



*High shift of fluids from intracellular to extracellular compartment can take place by:*

- A. high release of ADH*
- B. Consumption of potable(normal) water*
- C. intravenous infusion of normal saline*
- D. intravenous infusion of hypotonic solution*
- E . High release of aldosteronr*

*Answer:E*

*. In normal person plasma is forming about.....of the total blood volume:*

*A.55%*

*B.95%*

*C.90%*

*D.10%*

*E.40%*

*Answer:A*

*Na<sup>+</sup> homeostasis is important for controlling all of the following EXCEPT:*

- A. BLOOD VOLUME*
- B. WATER HOMEOSTASIS*
- C. ONCOTIC PRESSURE*
- D. EXTRACELLULAR FLUID VOLUME*
  
- E. OSMOLALITY*

*ANSWER: C*

*What is the primary determinant of body fluid volume?*

*A) Electrolyte concentration*

*B) Protein concentration*

*C) Osmotic pressure*

*D) Hydrostatic pressure*

*Answer: C) Osmotic pressure*

*What is the difference between intracellular and extracellular fluid?*

*A) Intracellular fluid has a higher protein concentration than extracellular fluid*

*B) Extracellular fluid has a higher osmotic pressure than intracellular fluid*

*C) Extracellular fluid is found inside cells, while intracellular fluid is found outside cells*

*D) Intracellular fluid is found inside cells, while extracellular fluid is found outside cells*

*Answer: D) Intracellular fluid is found inside cells, while extracellular fluid is found outside cells*

*How does the body respond to a decrease in blood volume?*

*A) By increasing urine output*

*B) By decreasing urine output*

*C) By decreasing the production of aldosterone*

*D) By increasing thirst and fluid intake*

*Answer: D) By increasing thirst and fluid intake*

*What is the role of the lymphatic system in fluid balance?*

- A) To reabsorb excess interstitial fluid and return it to the bloodstream*
- B) To regulate the production of aldosterone*
- C) To maintain electrolyte balance*
- D) To regulate blood pressure*

*Answer: A) To reabsorb excess interstitial fluid and return it to the bloodstream*

*What is the mechanism behind the development of ascites?*

*A) Increased production of aldosterone*

*B) Increased hydrostatic pressure in the portal vein*

*C) Decreased osmotic pressure in the peritoneal cavity*

*D) Increased lymphatic drainage from the peritoneal cavity*

*Answer: B) Increased hydrostatic pressure in the portal vein*



*Which of the following hormones is NOT involved in fluid balance regulation?*

*A) Aldosterone*

*B) Vasopressin*

*C) Angiotensin II*

*D) Insulin*

*Answer: D) Insulin*

*How does the body respond to a decrease in blood pressure?*

- A) By decreasing urine output*
- B) By increasing thirst and fluid intake*
- C) By decreasing the production of aldosterone*
- D) By increasing the production of atrial natriuretic peptide*

*Answer: D*

*Listed below are the hydrostatic and oncotic pressure across a muscle capillary wall.*

*Mean capillary hydrostatic pressure=30 mmHg*

*Plasma colloid osmotic pressure= 25 mmHg*

*Interstitial colloid osmotic pressure=10 mmHg*

*Interstitial hydrostatic pressure=5 mmHg*

*What is the net filtration pressure (in mmHg) for fluid movement across the capillary wall?*

*A-25 mmHg B-0 mmHg C-5 mmHg D-15 mmHg*

*E-10 mmHg*

*Answer:E*

*What is a hypotonic solution?*

*A. An external solution with a higher concentration than inside a cell.*

*B. An external solution of 0.9% NaCl (molecular weight of NaCl 58.5).*

*C. An internal solution with 0.9% NaCl (molecular weight of NaCl= 58.5). D. An external solution with the same concentration as inside the cell.*

*E. An external solution with a lower concentration than inside a Cell.*

*Answer: E*

*Which of the following is the approximate extracellular fluid volume of a normal Individual? (male)*

- A. 5% of body mass*
- B. 60% of body mass*
- C. 10% of body mass*
- D. 20% of body mass*
- E. 40% of body mass*

*Answer: D*

*23-year-old man is brought to the emergency department after collapsing during basketball practice. On admission, he is lethargic and appears confused. His coach reports that it was hot in the gym and he was drinking a lot of water during practice. An increase in which of the following most likely course :*

*A: Intracellular tonicity*

*B: Extracellular tonicity*

*C: Intracellular volume*

*D: Extracellular volume*

*E: Plasma volume*

*Answer: C*

*A study is performed to understand the fluid compartments of the body. Researchers divide body fluid compartments into two main categories: intracellular and extracellular. Extracellular gets further subdivided into interstitial fluid and plasma. Which of the following statements is correct?*

*A. Potassium ion concentration is higher in extracellular fluid than in intracellular fluid*

*B. The highest amount of water in all compartments is found in the*

*intestinal compartment*

*C. Sodium ion concentration is higher in the intracellular compartment than in the extracellular compartment*

*D. The interstitial fluid has a slightly higher concentration of chloride ions than plasma*

*E. The highest amount of water in all compartments is found in the plasma compartment*

*Answer: D*



*A study is performed to determine the volume of water found in different body compartments. In the study, an indicator-dilution method using labeled inulin was used. The volume calculated from the inulin-dilution method represents one of the following?*

*A. The plasma volume*

*B. The extracellular fluid volume*

*C. The interstitial fluid volume*

*D. Total body fluid volume*

*E. The intracel*

*Answer: B*

## *Conduction system of the heart*

*If the ventricular Purkinje fibers become the pacemaker of the heart, what is the expected heart rate?*

*A-30/min*

*B-65/min*

*C-75/min*

*D-50/min*

*E-85/min*

*Answer:A*

*At phase (2) of an action potential in a ventricular muscle cell which of the following is true?*

*A-The chemical gradient for  $\text{Ca}^{++}$  tends to move this ion inside*

*B-The electrochemical gradient for  $\text{K}^+$  tends to move this ion inside*

*C- $\text{Na}^+$  permeability greatly increases*

*D-This phase is responsible for the short refractory period of cardiac action potential*

*Answer:A*

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

*A-Atrial muscle*

*B-Ventricular muscle*

*C-Purkinje fibers*

*D-Atrioventricular node*

*E-Sinoatrial node*

*Answer:D*

*Intracellular calcium homeostasis in cardiac muscle cell is characterized by:*

*A-Na<sup>+</sup>/Ca<sup>++</sup> exchanger is found in cardiac as well as in skeletal muscle*

*B-Mitochondrial Na<sup>+</sup>/Ca<sup>++</sup> exchanger works in pathological states*

*C-Na<sup>+</sup>/Ca<sup>++</sup> exchanger exchanges one sodium for one calcium ions*

*D-Ca<sup>++</sup> pump in the cardiac muscle sarcolemma is low affinity but high capacity pump*

*E-Ca<sup>++</sup> pump of the sarcoplasmic reticulum is not*

*found in the cardiac muscle cells*

*Answer:D*

*Slow response action potential (pacemaker potential) is characterized by?*

*A-During phase 4 the transmembrane potential is closer to  $Ca^{++}$  equilibrium*

*potential rather than to  $Na^{+}$  equilibrium potential*

*B-It has longer plateau phase than fast response potential of ventricular cells*

*C- $dV/dT$  (change in voltage per unit change in time) of phase 0 is much slower than ventricular cell potential phase 0*

*D- $Ca^{++}$  ions is responsible for phase 2*

*E- It has more negative resting membrane potential*

*than ventricular cell potential*

*Answer:E*

*The complete sequence of electrical activation in the heart follows which pathway?*

*a) SA node → AV node → Bundle of His → Purkinje fibers*

*b) AV node → Bundle of His → SA node → Purkinje fibers*

*c) Purkinje fibers → Bundle of His → AV node → SA node*

*d) Bundle of His → Purkinje fibers → SA node → AV node*



*Answer: A*

*The Purkinje fibers are responsible for:*

- a) Transmitting the electrical signal to the atria*
- b) Coordinating atrial contraction*
- c) Initiating the electrical impulse in the ventricles*
- d) Facilitating communication between the atria and ventricles*

*Answer: c*

*The SA node is located in which chamber of the heart?*

- a) Right atrium*
- b) Left atrium*
- c) Right ventricle*
- d) Left ventricle*

*Answer: a*

*The electrical impulse that initiates the heartbeat originates from which structure?*

- a) Atrioventricular (AV) node*
- b) Sinoatrial (SA) node*
- c) Bundle of His*
- d) Purkinje fibers*

*Answer: b*

*Abnormalities in the conduction system of the heart can lead to:*

- a) Bradycardia*
- b) Tachycardia*
- c) Arrhythmias*
- d) All of the above*

*Answer: d*

*Parasympathetic stimulation of the heart causes hyperpolarization of the cell membrane by:*

- a) Activating sodium-potassium ATPase pumps*
- b) Inhibiting sodium influx into cardiac cells*
- c) Increasing potassium influx into cardiac cells*
- d) Suppressing calcium release from the sarcoplasmic reticulum*

*Answer: c*

*Activation of the sympathetic nervous system increases the force of myocardial contraction by:*

- a) Enhancing calcium release from the sarcoplasmic reticulum*
- b) Inhibiting calcium reuptake into the sarcoplasmic reticulum*
- c) Increasing potassium efflux from cardiac cells*
- d) Facilitating sodium influx into cardiac cells*

*Answer: a*

*Stimulation of the parasympathetic nervous system leads to:*

- a) Increased heart rate and conduction velocity*
- b) Decreased heart rate and conduction velocity*
- c) Vasodilation of coronary arteries*
- d) Prolonged QT interval on the electrocardiogram (ECG)*

*Answer: b*

*Stimulation of the sympathetic nervous system leads to:*

- a) Increased heart rate and conduction velocity*
- b) Decreased heart rate and conduction velocity*
- c) Constriction of coronary arteries*
- d) Prolonged PR interval on the electrocardiogram (ECG)*

*Answer: a*



*Parasympathetic stimulation of the heart leads to:*

*A) Negative chronotropic but almost no inotropic*

*B) action Negative chronotropic and negative inotropic effect*

*C) Negative chronotropic and positive inotropic effect*

*D) Positive chronotropic but negative inotropic effect*

*E) Positive chronotropic and positive inotropic effect*

*Answer:A*

*The important function of cardiac Purkinje system is to :*

- A) Increase the conduction of impulses.*
- B) Has no function in conduction of the impulse.*
- C) Increase the force of ventricular contraction.*
- D) Amplify the cardiac impulses.*

*Answer:A*

*About the cardiac conductivity, all the following are true EXCEPT:*

*A:It is increased by sympathetic stimulation.*

*B:It is slowest in the A-V node.*

*C: It is slowest in the ventricular muscle.*

*D :It is decreased by vagal stimulation.*

*E:It is maximal in the Purkinje fibres*

*Answer:C*

*Local and humoral control of tissue blood flow*

*Which of the following is NOT a local control mechanism of tissue blood flow?*

- a) Autoregulation*
- b) Metabolic control*
- c) Sympathetic control*
- d) Myogenic control*

*Answer: c*

*Metabolic control of tissue blood flow involves the release of which vasodilator substance?*

- a) Angiotensin II*
- b) Norepinephrine*
- c) Nitric oxide (NO)*
- d) Endothelin*

*Answer: c*

*Which of the following metabolic byproducts leads to vasodilation and increased tissue blood flow?*

- a) Adenosine*
- b) Carbon dioxide*
- c) Potassium ions*
- d) Angiotensin II*

*Answer: a*

*Vasodilators released during metabolic control cause relaxation of:*

- a) Arterioles*
- b) Venules*
- c) Capillaries*
- d) Veins*

*Answer: a)*



*The myogenic response of arterioles involves their ability to constrict in response to:*

- a) Increased metabolic activity*
- b) Stretch caused by increased pressure*
- c) Vasoconstrictor substances*
- d) Autonomic stimulation*

*Answer: b*

*Which of the following is NOT a vasoconstrictor substance involved in humoral control of tissue blood flow?*

- a) Endothelin*
- b) Thromboxane*
- c) Angiotensin II*
- d) Nitric oxide (NO)*

*Answer: d*

*The renin-angiotensin-aldosterone system (RAAS) plays a role in regulating tissue blood flow by:*

- a) Vasodilation of arterioles*
- b) Increasing metabolic activity*
- c) Increasing local vascular resistance*
- d) Stimulating sodium and water retention*

*Answer: c*

*Which of the following substances acts as a potent vasoconstrictor in humoral control of tissue blood flow?*

- a) Nitric oxide (NO)*
- b) Prostaglandins*
- c) Endothelin*
- d) Adenosine*

*Answer: c*

*Humoral control of tissue blood flow involves the release of vasoactive substances that act on:*

- a) Smooth muscle cells*
- b) Cardiac muscle cells*
- c) Endothelial cells*
- d) Neurons*

*Answer: a*

*The renin-angiotensin-aldosterone system (RAAS) can contribute to increased tissue blood flow by:*

- a) Inducing vasodilation of arterioles*
- b) Inhibiting the release of norepinephrine*
- c) Promoting sodium and water excretion*
- d) Stimulating the release of nitric oxide (NO)*

*Answer: d*

*Which of the following plays a role in regulating blood pressure and blood flow?*

*a) Autoregulation*

*b) Metabolic control*

*c) Renin-angiotensin-aldosterone system (RAAS)*

*d) Myogenic control*

*Answer: c*

*The release of norepinephrine by sympathetic nerve fibers leads to:*

- a) Vasodilation*
- b) Decreased blood flow*
- c) Increased blood flow*
- d) Activation of the RAAS*

*Answer: b*



*Which of the following factors is NOT involved in autoregulation of tissue blood flow?*

- a) Nitric oxide (NO)*
- b) Adenosine*
- c) Potassium ions*
- d) Oxygen concentration*

*Answer: d*

*The myogenic response of arterioles helps to maintain stable tissue blood flow by:*

- a) Dilating blood vessels during increased pressure*
- b) Constricting blood vessels during decreased pressure*
- c) Balancing sympathetic and parasympathetic stimulation*
- d) Regulating cardiac output*

*Answer: b*

*Which of the following factors is responsible for the myogenic response of arterioles?*

- a) Metabolic byproducts*
- b) Stretch of arteriolar smooth muscle*
- c) Sympathetic nerve fibers*
- d) Vasoactive substances*

*Answer: b*

*The release of nitric oxide(NO) during local control of tissue blood flow leads to:*

- a) Vasoconstriction*
- b) Increased sympathetic activity*
- c) Vasodilation*
- d) Activation of the renin-angiotensin system*

*Answer: c*

*During autoregulation, if perfusion pressure decreases, arterioles will:*

- a) Dilate to increase blood flow*
- b) Constrict to decrease blood flow*
- c) Release vasodilator substances*
- d) Activate the sympathetic nervous system*

*Answer: a*

*Which of the following is responsible for vasoconstriction in response to sympathetic stimulation?*

- a) Nitric oxide (NO)*
- b) Prostaglandins*
- c) Norepinephrine*
- d) Adenosine*

*Answer: c*

*Signaling*

*Which of the following hormones has intracellular receptors ?*

- a. Thyroid hormone (T3)*
- b. Glucagon*
- c. Insulin*
- d. Growth hormone*
- e. Thyroid stimulating hormone (TSH)*

*Answer:A*



*All of the following turn off G Protein Coupled Receptor GPCR signal EXCEPT :*

- a. Phosphodiesterase activation*
- b. Phosphatases activation*
- c. Phospholipases activation*
- d. Ga hydrolyses GTP.*
- e. Beta-Arrestin binding to receptor*

*Answer:C*

*The protein (ligand) associated with leptin receptor:*

- A) Serine Kinase*
- B) Janus Kinase (JAK)*
- C) Guanylyl cyclase*
- D) Insulin*
- E) None of the above*

*Answer: B*

*Some cells secrete chemicals into the extracellular fluid that act on neighboring cells in the same tissue . which of the following refers to this type of regulation?*

- A) neural*
- B) endocrine*
- C) neuroendocrine*
- D) paracrine*
- E) autocrine*

*Answer:D*

*which of the following hormones activated enzyme-linked receptors ?*

*A) ADH*

*B) insulin*

*C) ACTH*

*D) PTH*

*E) aldosterone*

*Answer: B*

*Which change would be expected to occur with increased binding of a hormone to plasma proteins?*

- A) increase in plasma clearance of the hormone*
  - B) decrease in half-life of the hormone*
  - C) increase in hormone activity*
  - D) increase in degree of negative feedback exerted by the hormone*
  - E) increase in plasma reservoir for rapid replenishment of free hormone*
- Answer: E*

*Which of the following hormones is both synthesized and stored in the pituitary gland?*

- A) growth hormone (GH)*
- B) GH releasing hormone (GHRH)*
- C) ADH*
- D) somatostatin*
- E) somatomedin*

*Answer:A*

*The type of membrane protein enables cells to respond to specific hydrophilic ligand by changes in the level of intracellular c-AMP?*

*A) ligand*

*B) cholesterol*

*C) phospholipid.*

*D) enzymes.*

*E) receptors.*

*Answer:E*

*.Which of the following physiological responses is greater for triiodothyronine (T3) than for thyroxine (T4) ?*

*A) secretion rate from the thyroid*

*B) plasma concentration*

*C) plasma half-life*

*D) affinity for nuclear receptors in target tissues*

*E) latent period for onset of action in target tissues*

*Answer: D*



*hormone that uses cGMP signaling pathway:*

*A) GnRH*

*B) ANP*

*C) GH*

*D) Prolactin*

*E) Aldosterone*

*Answer: B*

*Clearance of a hormone is high if:*

*A) The half-life is high*

*B) The percentage of the hormone bound to plasma proteins is low*

*C) The hormone is inactive*

*D) The hormone is lipophilic*

*E) The hormone is a prohormone*

*Answer: B*

*Receptor affinity to a ligand is judged by:*

- A) Similarity of structure-directly related*
- B) Clearance rate of ligand-inversely related*
- C) Half-life ligand-inversely related*
- D)  $K_d$  (dissociation)-inversely related*
- E) Density of receptor in a given tissue-directly related*

*Answer:D*

*Which of the following hormones has nuclear receptors that are typically associated with retinoic acid receptors (RXR)?*

- A) Insulin*
- B) Leptin*
- C) T3 (triiodothyronine)*
- D) Testosterone*
- E) Dopamine*

*Answer:C*

*When a G protein coupled receptor is activated, any of the following may occur EXCEPT:*

*A) Increase in cAMP*

*B) Decrease in cAMP*

*C) Increase in  $Ca^{++}$*

*D) CREB (cAMP response element binding protein) activation*

*E) STAT (signal transduction activator for transcription) phosphorylation*

*Answer:E*

*Which of the following hormones has intracellular receptors:*

- A) Glucagon*
- B) Follicle stimulating hormone*
- C) Growth Hormone*
- D) Estradiol*

*Answer:D*

*All of the following are derivatives of Tyrosine  
EXCEPT:*

*A) Epinephrine*

*B) Dopamine*

*C) Thyroxine*

*D) Thyroid Stimulating Hormone*

*E) Norepinephrine*

*Answer:D*

*Which of the following is rarely bound to plasma proteins in blood:*

*A) Testosterone*

*B) Insulin*

*C) Cortisol*

*D) Thyroxine*

*E) Estrogen*

*Answer: B*



*$\alpha$ 1-Adrenergic receptors are coupled to which Enzyme-Product:*

*A) Adenylyl Cyclase-cAMP*

*B) Guanylyl Cyclase-cGMP*

*C) Phospholipase C-DAG(diacylglycerol),IP3  
(inositol triphosphate )*

*D) Phospholipase A-arachidonic acid*

*E) Phosphodiesterase-cAMP*

*Answer:E*

*Leptin hormone induces its effect mainly through:*

*A) PKA-CREB pathway*

*B) JAK-STAT pathway*

*C) Ca<sup>++</sup> -Calmodulin pathway*

*D) Adenylyl cyclase -cAMP pathway*

*E) Guanylyl cyclase-cGMP pathway*

*Answer:B*

*The type of signaling when the cell that secretes the signal is also the target is called:*

- a. Contact-dependent*
- b. Endocrine*
- c. Paracrine*
- d. Autocrine*

*Answer:D*

*Prolonged high levels of glucose and sustained release of insulin on the long term will cause Diabetes Type II due to :*

- a. Decreased metabolism of insulin.*
- b. Increased clearance of insulin*
- c. Death of insulin secreting cells*
- d. Desensitization of insulin receptors*
- e. Upregulation of insulin receptors*

*Answer:D*

*In a lab experiment, cultured endothelial cells were treated with a drug that increases synthesis of a hormone. After treatment, levels of cyclic GMP were significantly increased, which of the following hormones might have been stimulated?*

- a. Epinephrine*
- b. Glucagon*
- c. Nitric oxide (NO)*
- d. Acetyl choline*
- e. Growth hormone*

*Answer:C*

*Location of cellular receptor proteins depend mainly on:*

*A) Chemical class of hormone*

*B) Function of hormone*

*C) Site of release*

*D) Type of cell*

*E) Half-life of hormone*

*Answer:A*

*Insulin receptor is an example of:*

*A) Ionotropic receptors*

*B) Metabotropic receptors*

*C) G Protein Coupled Receptor (GPCR) D)*

*Receptor Tyrosine kinase*

*E) Voltage gated channel*

*Answer:D*

*Epinephrine may have the following second messengers?*

*A) cAMP*

*B) Ca<sup>++</sup>*

*C) IP3*

*D) DAG*

*E) All of the above mentioned are correct*

*Answer:E*



*The following are G Protein Coupled Receptor (GPCR) EXCEPT:*

- A) Glucagon receptor*
- B)  $\beta$ -adrenergic receptor*
- C) Growth factors and cytokines receptors*
- D) Vasopressin (Antidiuretic hormone)*
- E)  $\alpha$ 2-adrenergic receptor*

*Answer:C*

*Best of luck*