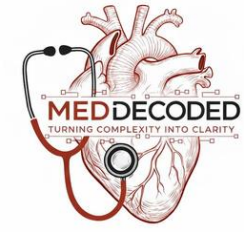


بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



PHYSIOLOGY

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ وَنَعْلَمُ مَا تُوَسْوِسُ بِهِ نَفْسُهُ وَنَحْنُ أَقْرَبُ إِلَيْهِ مِنْ حَبْلِ الْوَرِيدِ ﴿١٠٠﴾

Past papers

Reviewed by : Lamar Khorma Abdullah Saffarini
Raghad Farraj Yaman Khalil
Ahmad Mohy Yamen Aljarrah
Yaman Feras

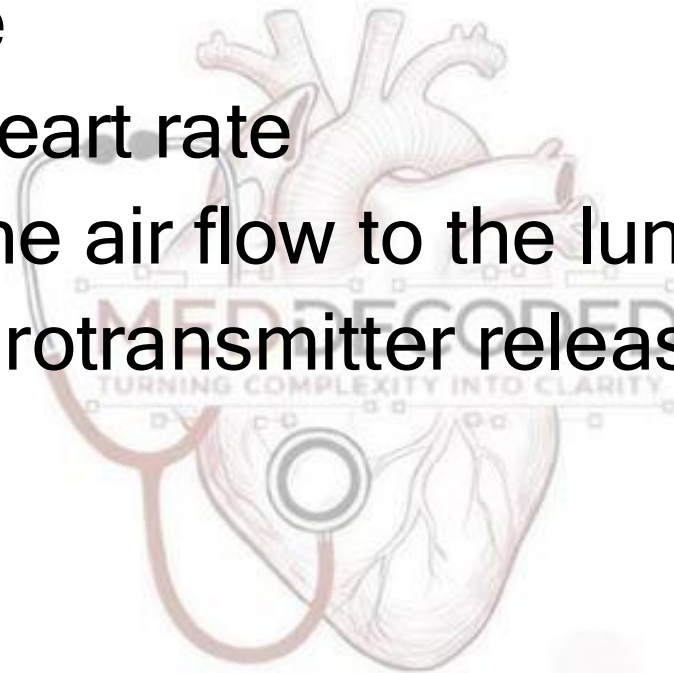


ANS

(17) Questions

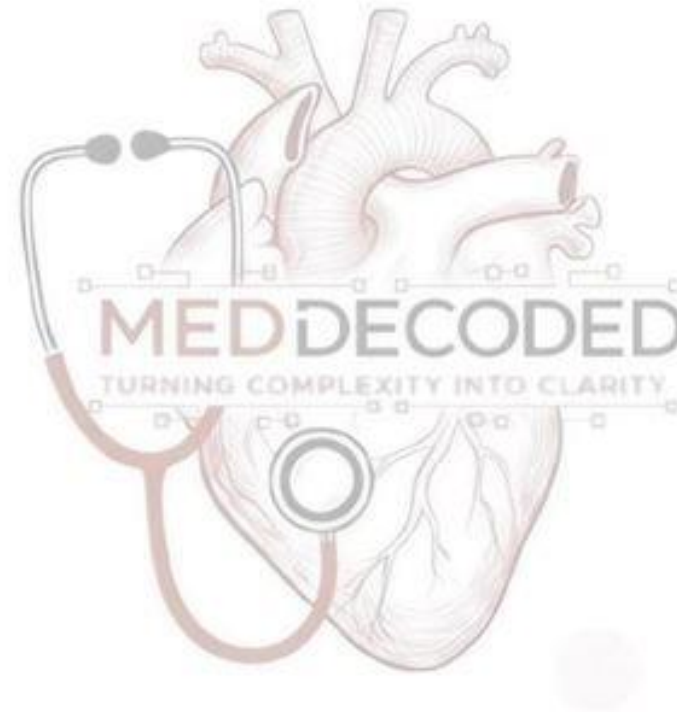
1. All of the following with regard to beta Adrenergic receptors are true, EXCEPT:

- A. They are present in the heart
- B. They are blocked by atropine
- C. Their stimulation increases heart rate
- D. Their stimulation increases the air flow to the lung
- E. They are stimulated by a neurotransmitter released by sympathetic nervous system



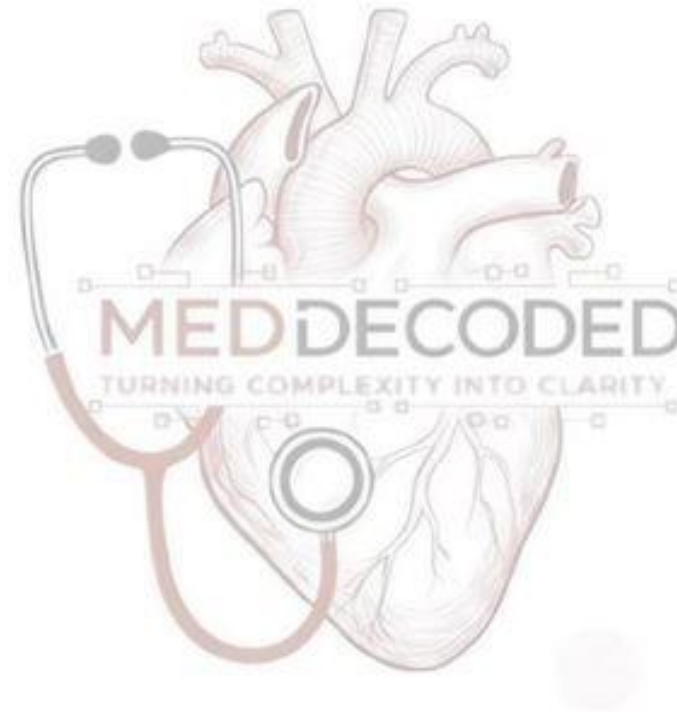
2. Which adrenergic receptor produces its stimulatory effects by the formation of inositol 1,4,5-triphosphate (IP₃) and an increase in intracellular [Ca²⁺]?

- A. α_1
- B. α_2
- C. β_1
- D. β_2



3. Which of the following is directly controlled by the somatic nervous system?

- A. Smooth muscle
- B. Cardiac muscle
- C. Skeletal muscle
- D. Abdominal muscle

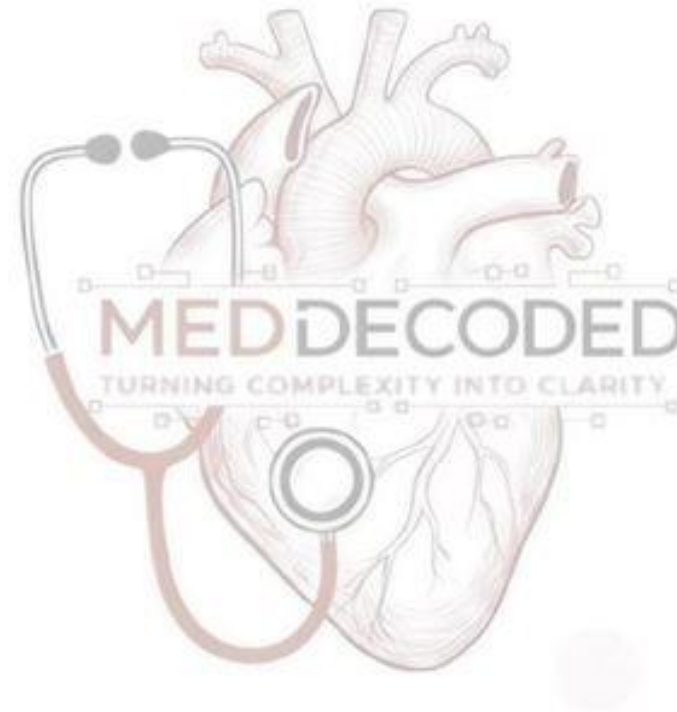


4. Regarding the autonomic nervous system, which of the following pairs are NOT related to each other?

- A. Acetylcholine and stimulation of muscarinic receptors
- B. Sympathetic division and release of norepinephrine
- C. Atropine and blocking of nicotinic receptors
- D. Sweating and sympathetic stimulation
- E. Medication with beta adrenergic blockers and decreasing heart rate

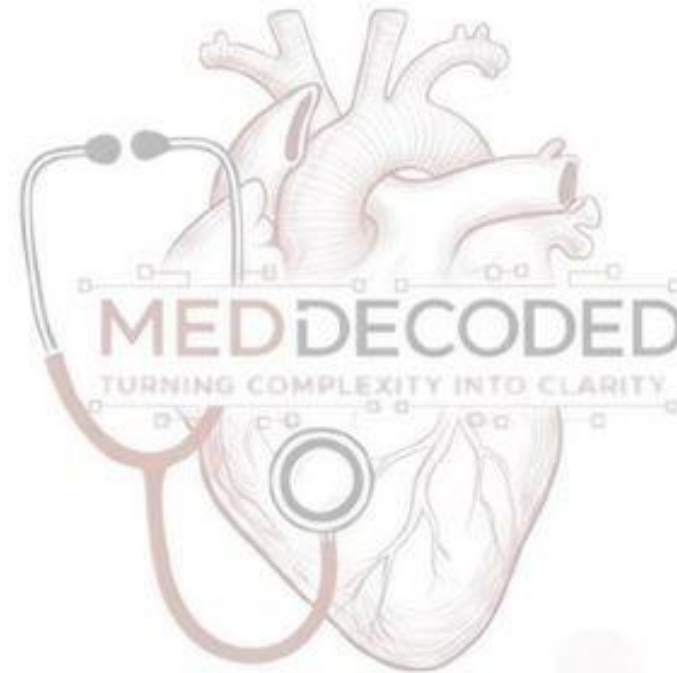
5. Which substance activates adrenergic alpha and beta equally well?

- A. Acetylcholine
- B. Norepinephrine
- C. Epinephrine
- D. Serotonin
- E. Dopamine



6. Gastrointestinal, nasal, lacrimal, and salivary glands are stimulated by which substance?

- A. Acetylcholine
- B. Norepinephrine
- C. Epinephrine
- D. Serotonin
- E. Dopamine

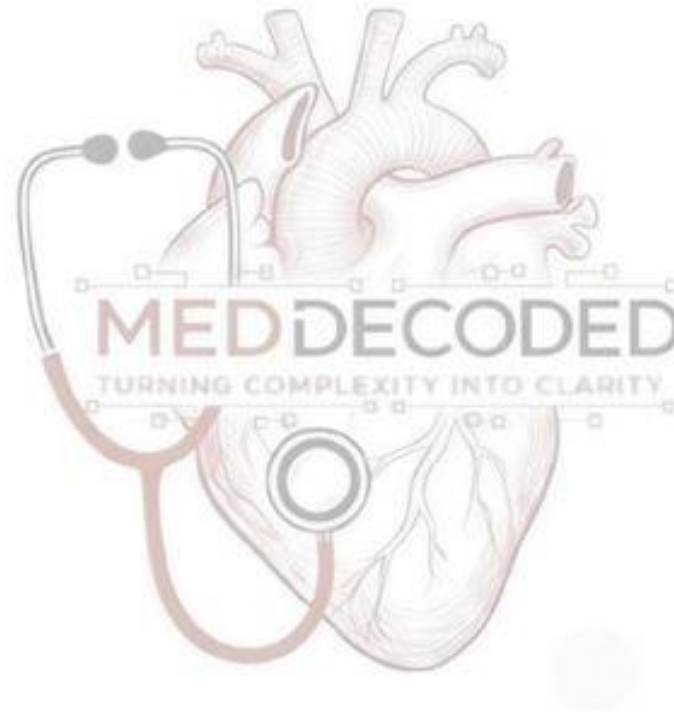


7. In a lab experiment, two plates of cultured liver cells were pre-treated with two different specific adrenergic receptors inhibitors (blockers) before adding epinephrine hormone to both plates. First plate was pre-treated with inhibitor (X), while the second plate was pre-treated with inhibitor (Y). Then, both were treated with epinephrine. cAMP was measured before adding epinephrine and was (10 micro-M). After treatment with epinephrine, plate 1 cAMP was (1 micro-M) and plate 2 was (100 micro-M). Which receptors did X and Y drugs inhibit?

- A. X: alpha 1 adrenergic receptor. Y: beta adrenergic receptor
- B. X: alpha 1 adrenergic receptor. Y: alpha 2 adrenergic receptor
- C. X: alpha 2 adrenergic receptor. Y: beta adrenergic receptor
- D. X: beta adrenergic receptor. Y: alpha 2 adrenergic receptor
- E. X: alpha 2 adrenergic receptor. Y: alpha 2 adrenergic receptor

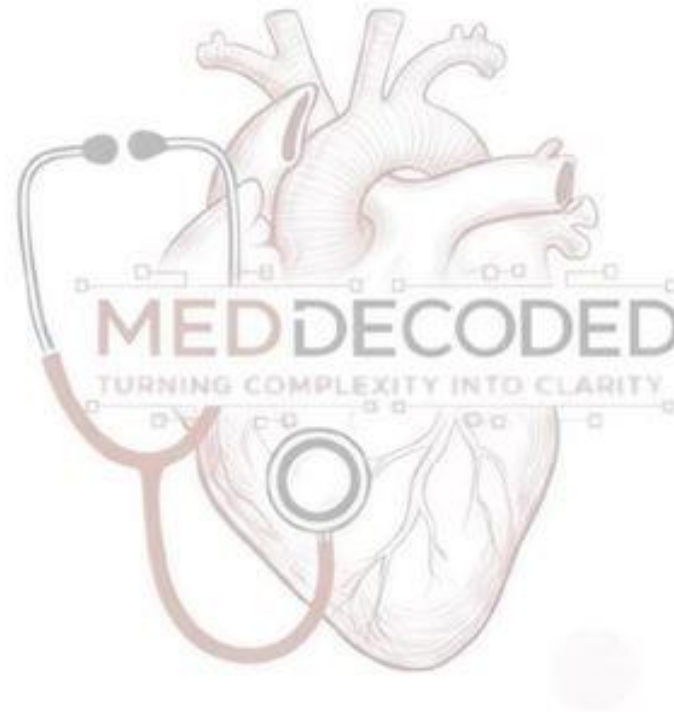
8. Muscarinic receptors are blocked by:

- A. Acetylcholine
- B. Nicotine
- C. Muscarine
- D. Epinephrine
- E. Atropine



9. All the following structures are bearing muscarinic receptors EXCEPT:

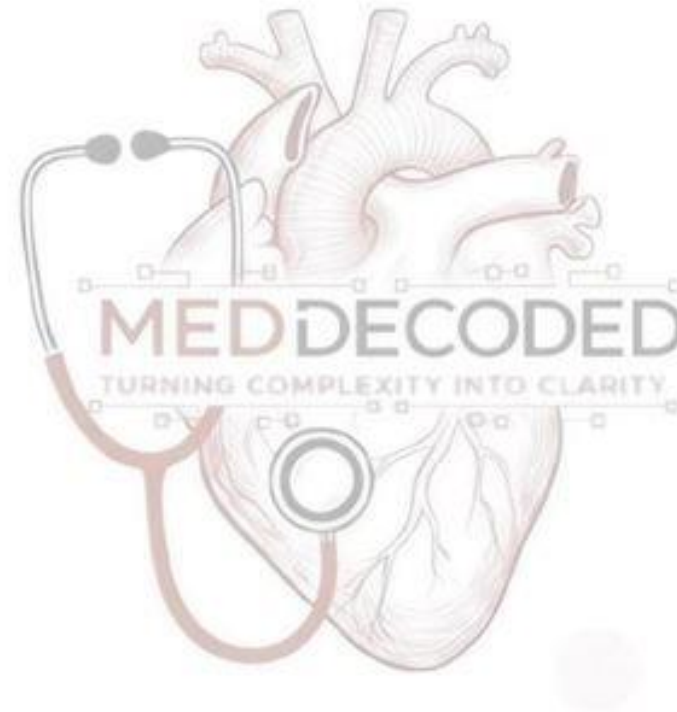
- A. Salivary glands
- B. Postganglionic neurons
- C. Intestine
- D. Heart conductive tissue
- E. Sweat glands



Answer: B

10. Activation of adrenergic receptors will result in all the following EXCEPT :

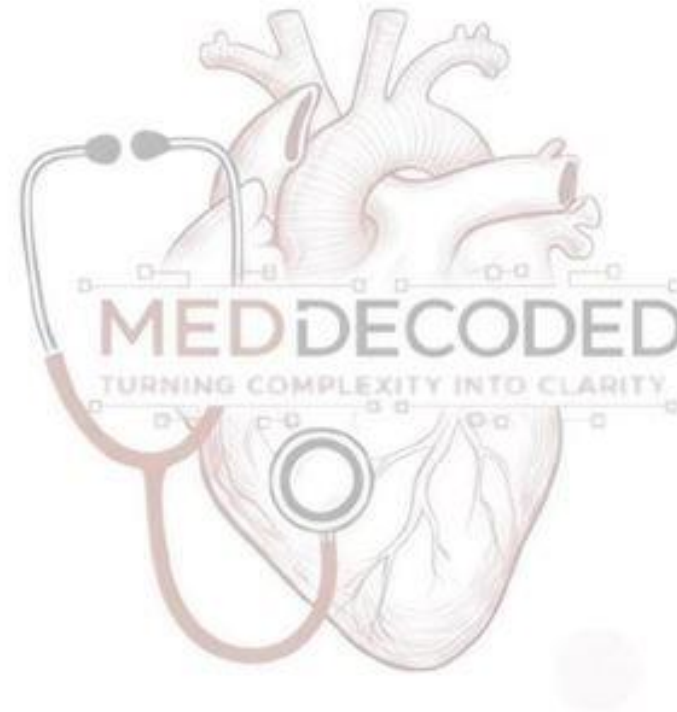
- A. Decreased salivation.
- B. Bronchodilation
- C. Sweating
- D. Increase heart rate.
- E. Constriction of blood vessels



Answer: C

11. What's wrong about Acetylcholine?

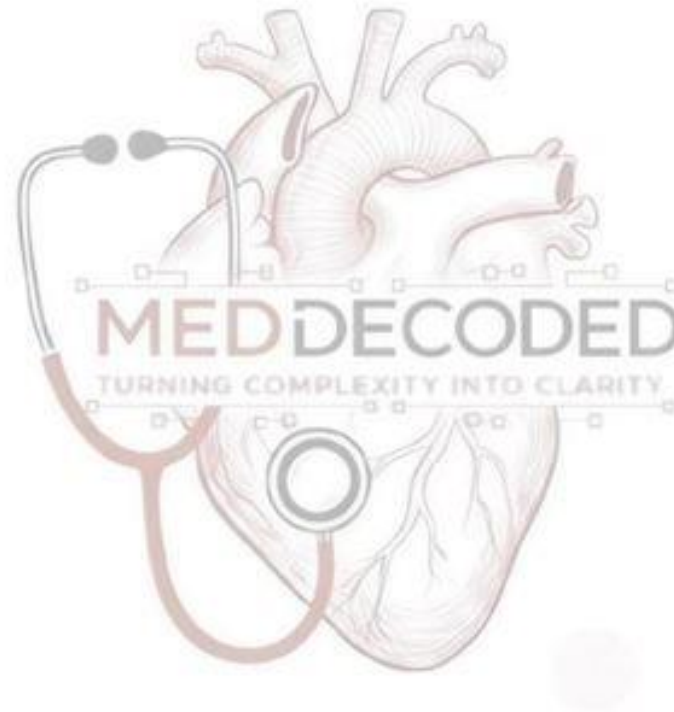
- A. It affects mood
- B. It causes contraction in the skeletal muscles
- C. It causes relaxation in heart



Answer: A

12. What activates muscarinic receptors?

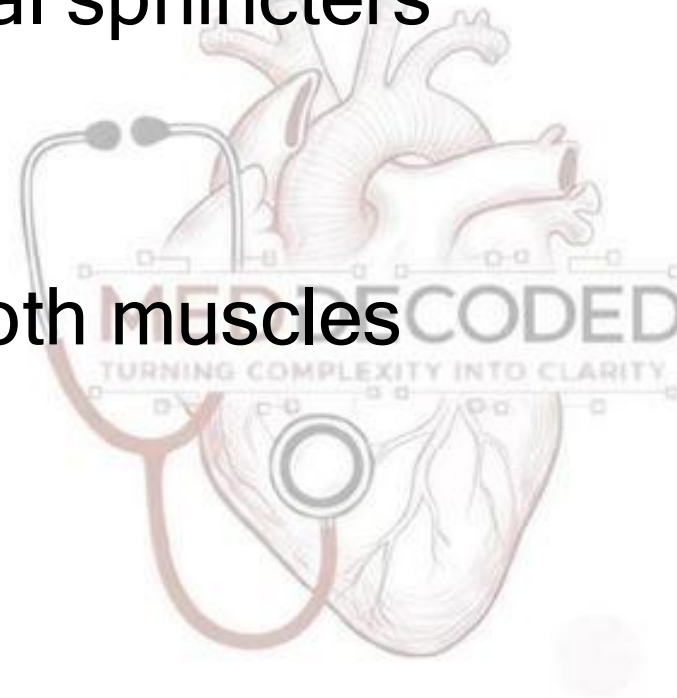
- A. Acetylcholine
- B. Dopamine
- C. serotonin
- D. Glutamate



Answer: A

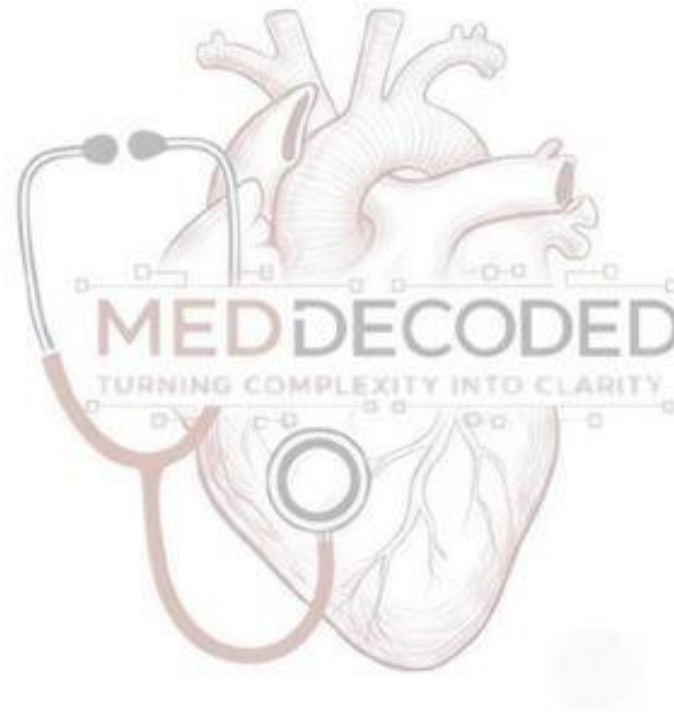
13. Which of the following actions is/are mediated by beta 2 receptors ?

- A. Increased heart rate
- B. Contraction of gastrointestinal sphincters
- C. Dilation of airways
- D. Relaxation of bladder wall
- E. Contraction of vascular smooth muscles
- F. C + D



14. Which of the following receptors increases IP3?

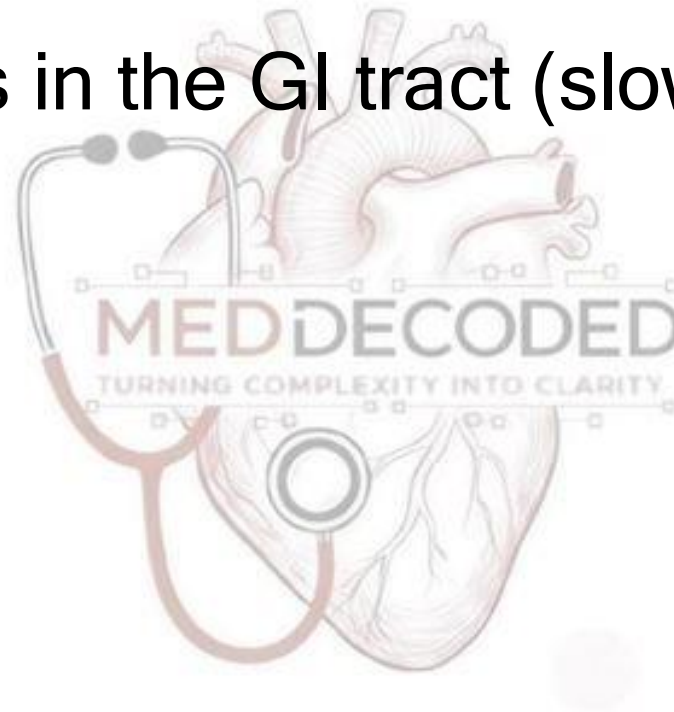
- A. M1
- B. M2
- C. Beta 1
- D. Alpha 2



Answer: A

15. Which of the following responses is not controlled by the sympathetic system?

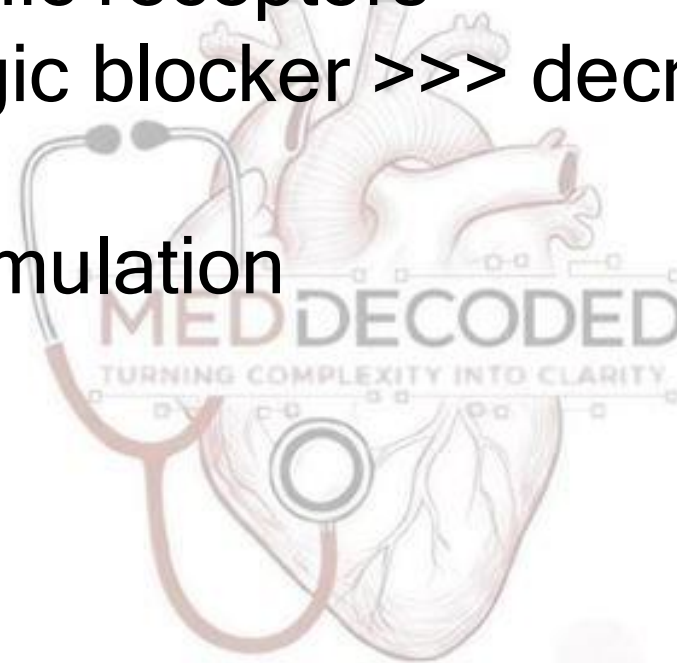
- A. Tachycardia
- B. Near sight accommodation
- C. Relaxation of smooth muscles in the GI tract (slow peristalsis)
- D. Increased metabolism
- E. Fight-or-flight response



Answer: B

16. Regarding to autonomic nervous system which of the following are Not related to each other?

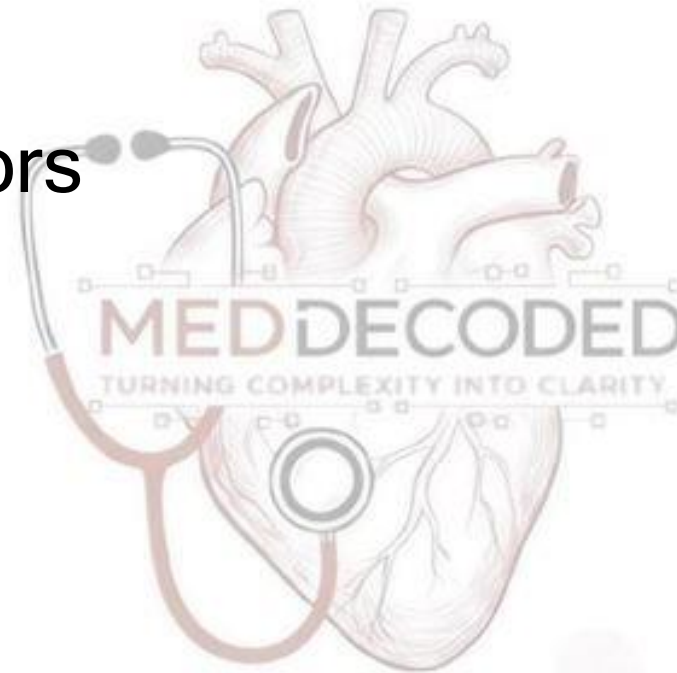
- A. ACh (acetylcholine) >>> stimulation of muscarinic receptor
- B. Atropine >>> blocker of nicotinic receptors
- C. Medication with beta adrenergic blocker >>> decreasing heart rate
- D. Sweating >>> sympathetic stimulation



Answer: B

17. Which autonomic receptor mediates secretion of epinephrine by the adrenal medulla?

- A. Adrenergic α 1 receptors
- B. Adrenergic β 1 receptors
- C. Adrenergic β 2 receptors
- D. Cholinergic muscarinic receptors



Answer: E

Membrane potential

(6) Questions

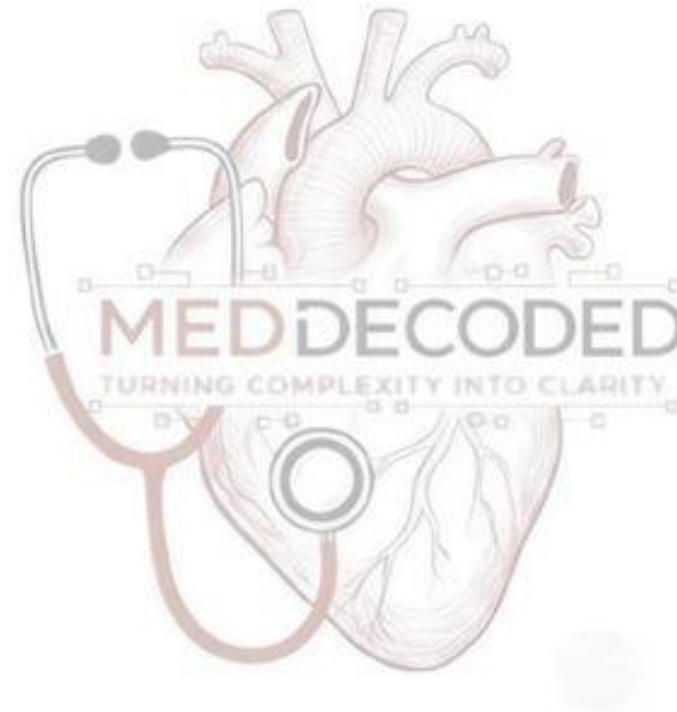
1. Which of the following would not be possible occurrences when signal build up occurs?

- A. They can reach AP as a result of EPSP
- B. IPSP can hyperpolarize the membrane
- C. They can reach AP as a result of IPSP
- D. An AP will reach if a number of EPSP > IPSP

2. Where would we find Voltage Regulated Channels?

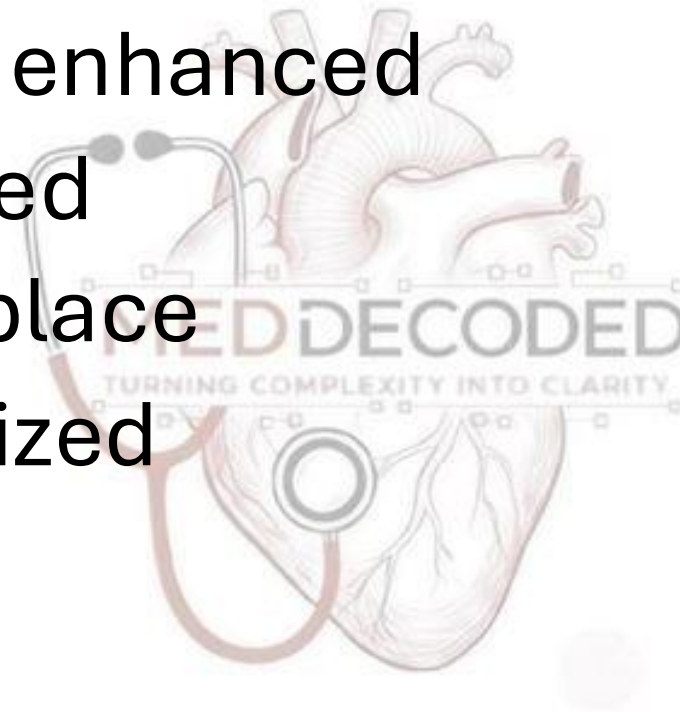
A. On The dendrites

B. On the Axons



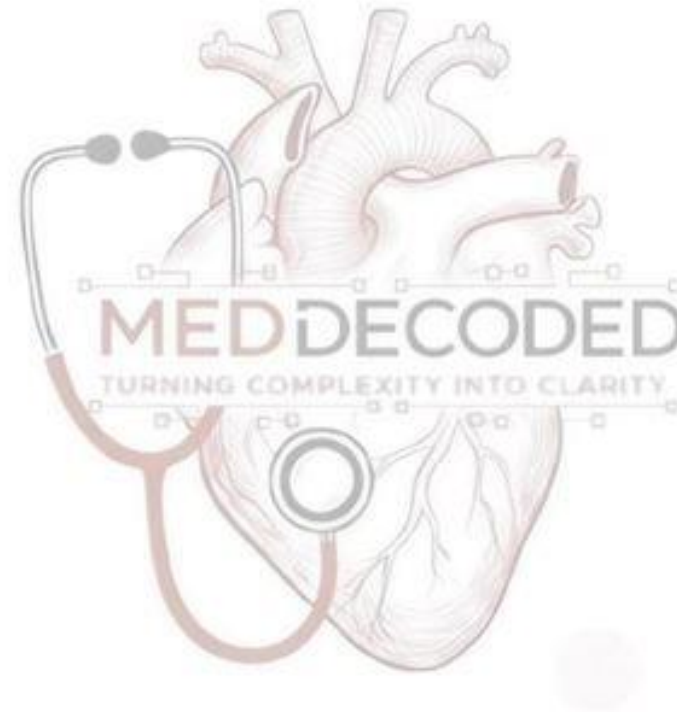
3. What happens when an IPSP is generated after EPSP?

- A. Membrane is more depolarized
- B. Effect of subthreshold is enhanced
- C. Action potential is reached
- D. A threshold event takes place
- E. Membrane is hyperpolarized



4. What is the term used to describe an AP that jumps of one node of Ranvier to another?

- A. IPSP conduction
- B. EPSP conduction
- C. Myelinated conduction
- D. Saltatory conduction



5. Prolonged changes in neuronal activity are usually achieved through the activation of which of the following?

- A. Voltage-gated chloride channels
- B. Transmitter-gated sodium channels
- C. G-protein–coupled channels
- D. Voltage-gated potassium channels



6. One of the following is TRUE:?

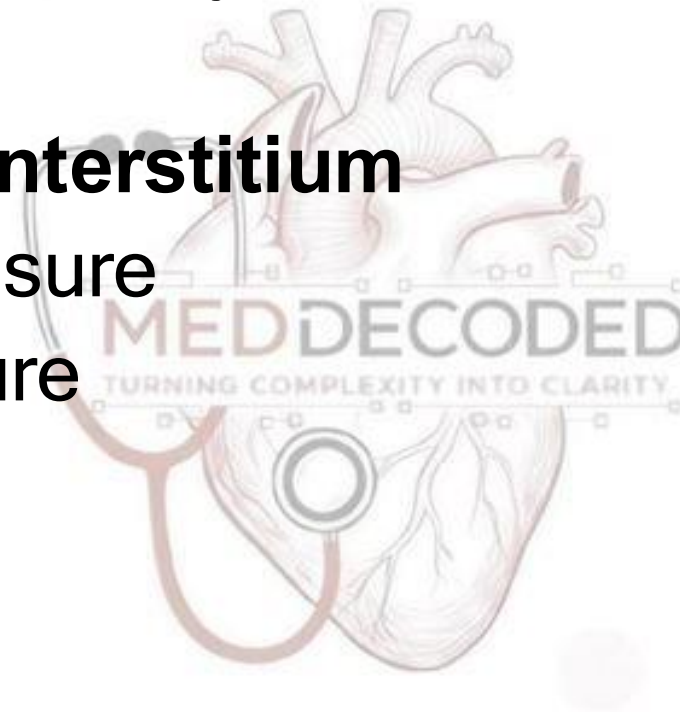
- A. In Convergence, the input signal spreads to an increasing number of neurons
- B. Divergence can act only on the same track
- C. Divergence means that multiple inputs are gathered together in a single neuron
- D. In convergence, the excitation will be on a single neuron
- E. Both C & D

Body Fluids

(27) Questions

1. A decrease in which one of the following would tend to increase lymph flow:

- A. Hydraulic conductivity of the capillary wall
- B. Capillary hydrostatic pressure
- C. Albumin concentration of the **interstitium**
- D. Interstitial colloid osmotic pressure
- E. Plasma colloid osmotic pressure



Answer: E

Exp! colloid osmotic pressure = oncotic pressure, A decrease in this pressure (often caused by a lack of plasma proteins like albumin) reduces the inward-pulling force

2. With regard to measurements of body fluids, which of the followings is TRUE:

- A. Inulin can be used to measure blood volume
- B. $^{22}\text{Na}^+$ radioisotope is used to measure total body fluids
- C. $^{40}\text{K}^+$ radioisotope is used to measuring intracellular fluid volume
- D. ^{125}I -albumin is used to measure intravascular fluids
- E. ^{51}Cr -labeled RBCs can be used for measuring extracellular fluid volume

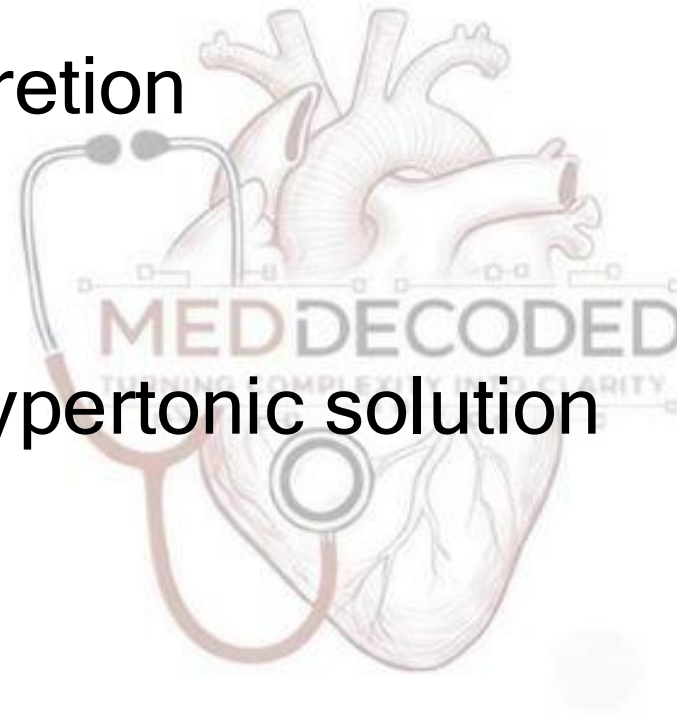
3. Which of the following changes favor(s) the movement of surrounding interstitial fluid into the capillary lumen (i.e., fluid reabsorption into the capillary)?

- A. An increase in the colloid osmotic pressure of the interstitial fluid surrounding the capillary
- B. An increase in the hydrostatic blood pressure in the capillary
- C. An increase in the colloid osmotic (oncotic) pressure of plasma
- D. A decrease in the hydrostatic pressure of the interstitial fluid surrounding the capillary
- E. An increase in the capillary permeability

Answer: C

4. All the followings can lead to hypernatremia with dehydration of cells EXCEPT:

- A. Hypotonic sweating
- B. Deficiency of aldosterone secretion
- C. Deficiency of ADH secretion
- D. Excessive intake of salts
- E. Excessive administration of hypertonic solution



Answer: B

Exp! Aldosterone causes Na reabsorption so a deficiency in it would cause loss of Na and water

5. 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?

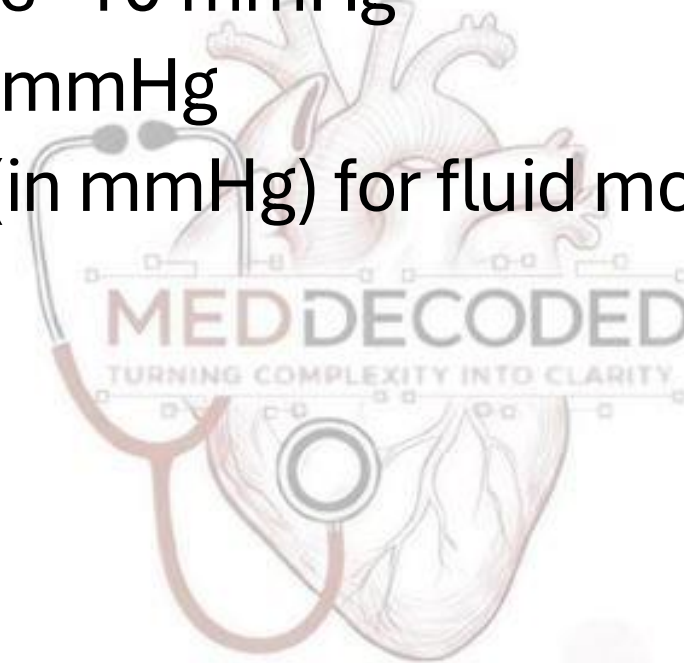
A. 25 mmHg

B. 0 mmHg

C. 5 mmHg

D. 15 mmHg

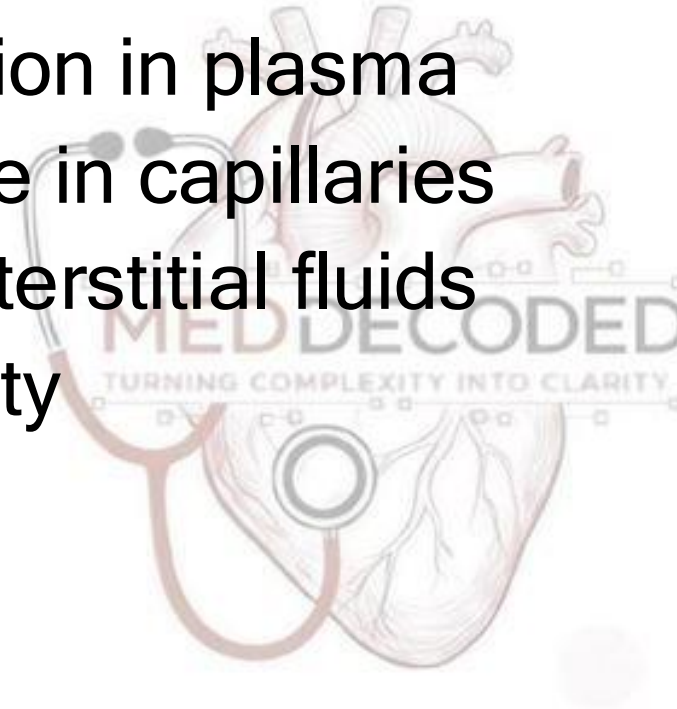
E. 10 mmHg



Answer: E
Exp! 30 out, 25 in, 10 out, 5 in

6. Edema at interstitial fluids can be generated by all the followings EXCEPT:

- A. Increased oncotic pressure in interstitial fluids
- B. Increased albumin concentration in plasma
- C. Increased hydrostatic pressure in capillaries
- D. Decreased lymph flow from interstitial fluids
- E. Increased capillary permeability

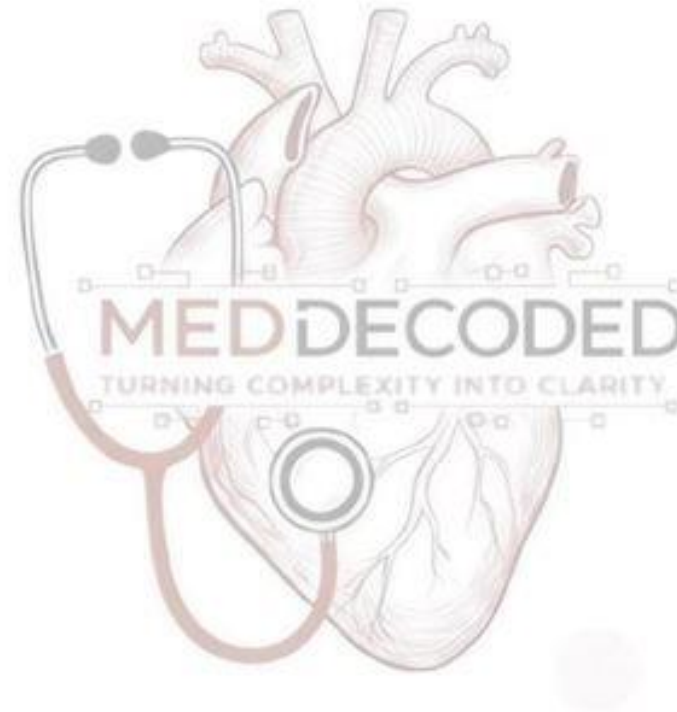


Answer: B

Exp! option E is not the answer. Proteins leak out of capillaries because increased permeability allows them to cross the vessel wall, and their concentration is higher inside the blood. Water follows the proteins into the interstitial space by osmosis, so more fluid leaves than returns

7. Na^+ homeostasis is important for controlling all the followings EXCEPT:

- A. Blood volume
- B. Water homeostasis
- C. Oncotic pressure
- D. Extracellular fluid volume
- E. Osmolality

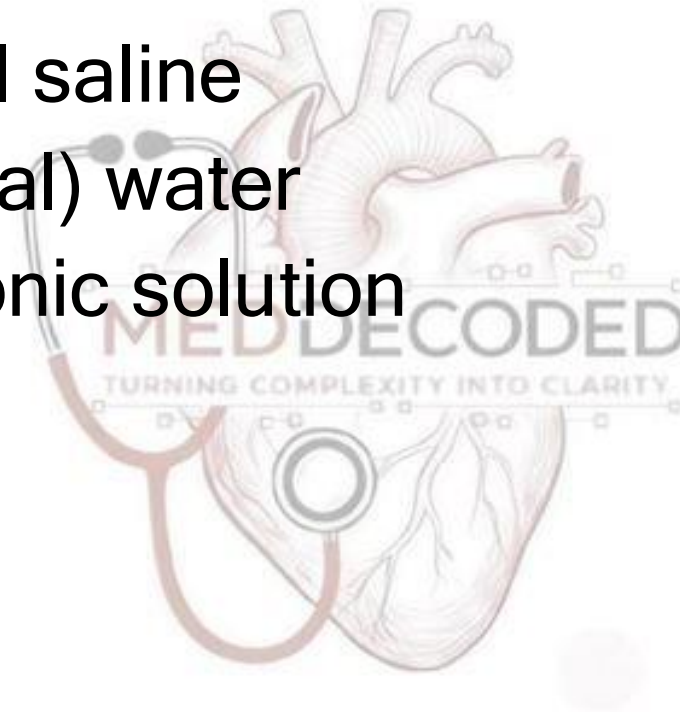


Answer: C

Exp! D and A are not the answer because they depend on Na^+ excretion in urine

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

- A. High release of ADH
- B. Intravenous infusion of normal saline
- C. Consumption of potable(normal) water
- D. Intravenous infusion of hypotonic solution
- E. High release of aldosterone

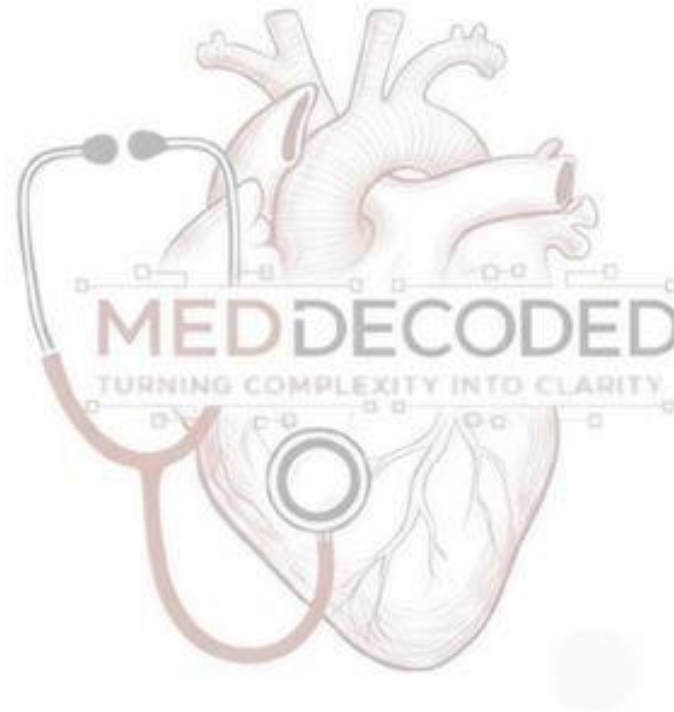


Answer: E

Exp! saline is a solution of water with NaCl in it

9. 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

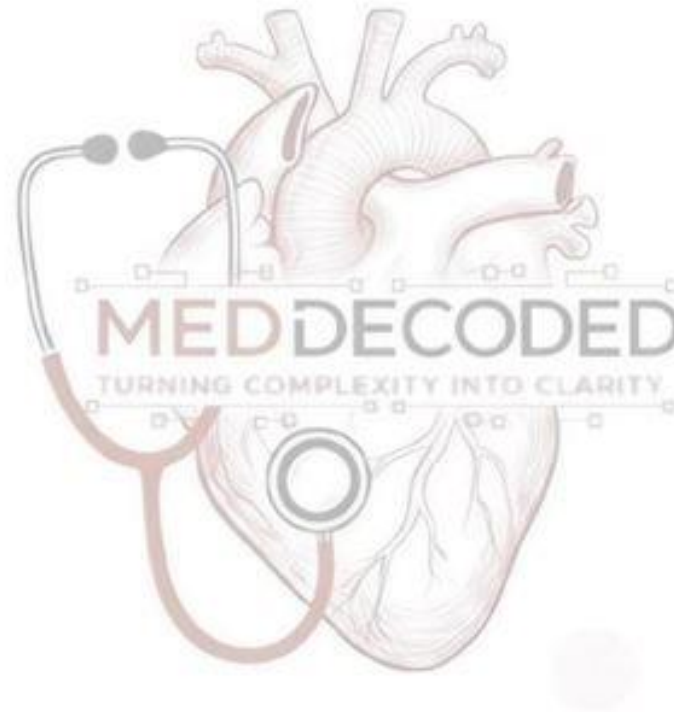


Answer: C

Exp! hypervolemic is increase in fluid volume

10. Interstitial fluid does NOT include:

- A. Synovial fluid
- B. Aqueous humor
- C. Blood plasma
- D. Cerebrospinal fluid



Answer: C

Exp! Aqueous humor is a clear watery fluid inside the eye
Blood plasma is intravascular

11. Which of the following pairs are NOT having similar effects on Na⁺ level of body fluids: (if both increase or both decrease then you can't consider this option the answer)

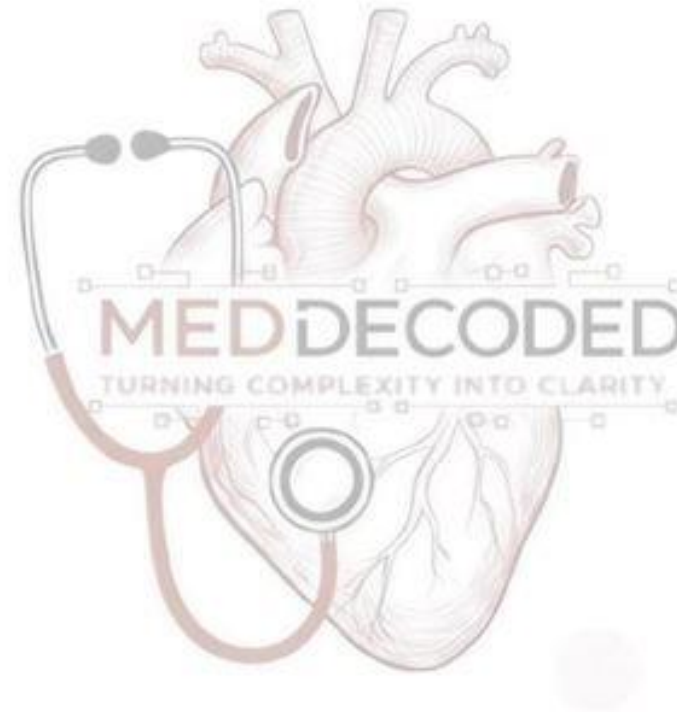
- A. Increased ADH secretion and drinking of high amounts of portable (normal) water.
- B. High release of aldosterone and ingestion of high amounts of salts
- C. Hypoaldosteronism (decreased aldosterone secretion) and deficiency of ADH
- D. Loss of hypotonic fluids from the body and activation of renin-angiotensin-aldosterone system
- E. High release of ANP (Atrial Natriuretic Peptide) and intravenous infusion of hypotonic solution

Answer: C

Exp! ADH causes water retention without directly affecting sodium reabsorption, which can dilute the sodium concentration in body fluids.

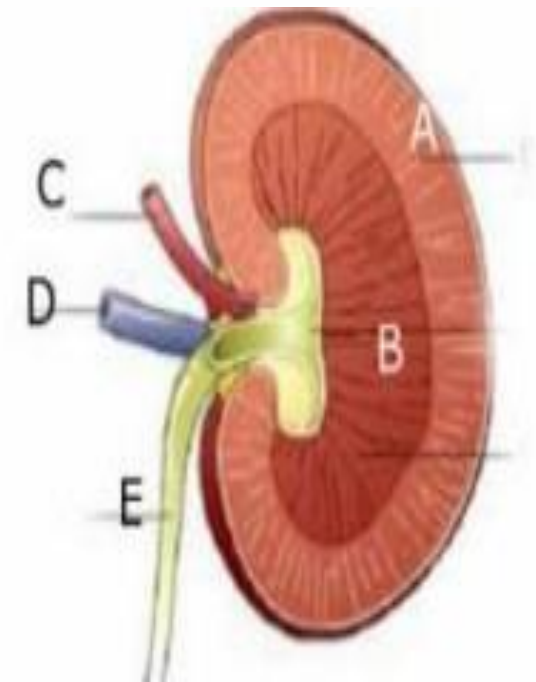
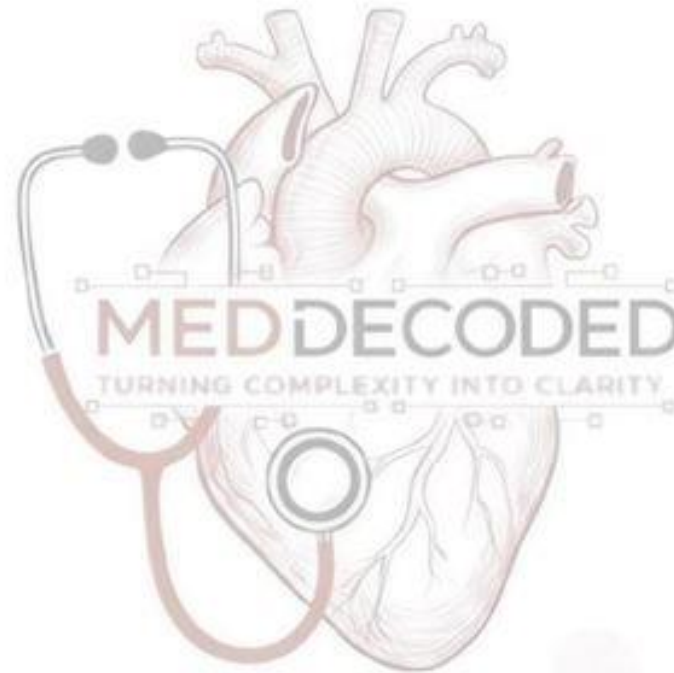
12. Na^+ homeostasis is important for controlling all of the followings EXCEPT:

- A. Blood volume
- B. Water homeostasis
- C. Oncotic pressure
- D. Extracellular fluid volume
- E. Osmolality



13. The primary enzyme released from the kidneys when blood pressure drops is:

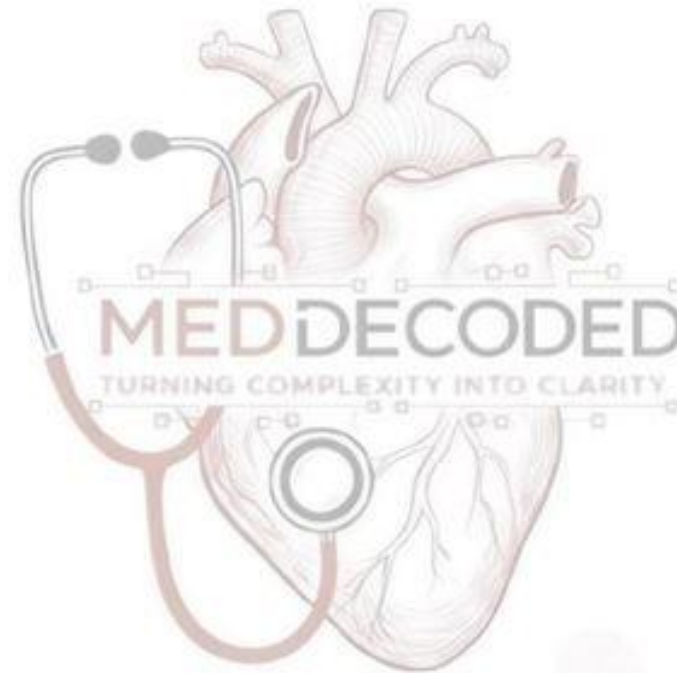
- A. Renin
- B. Angiotensin
- C. Aldosterone
- D. ADH



Answer: A

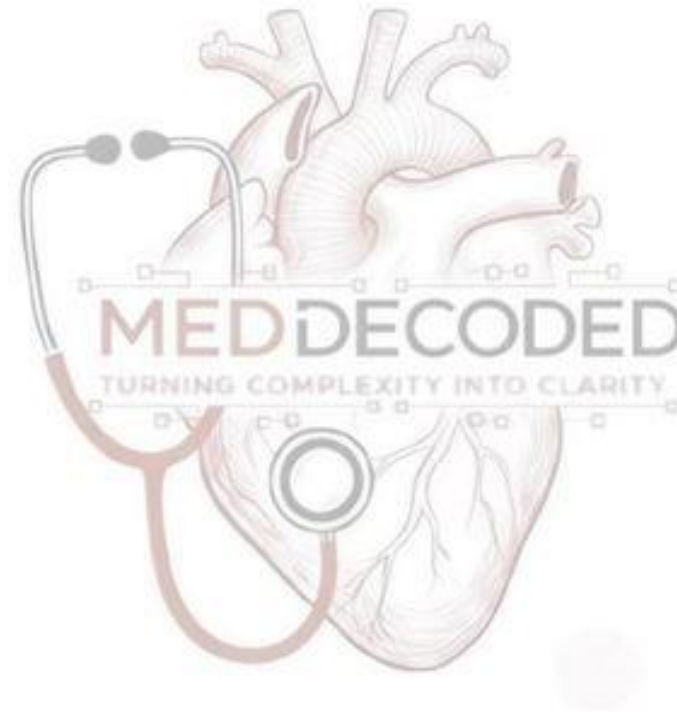
14. In normal person plasma is forming about of the total blood volume:

- A. 55%
- B. 95%
- C. 90%
- D. 10%
- E. 40%



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

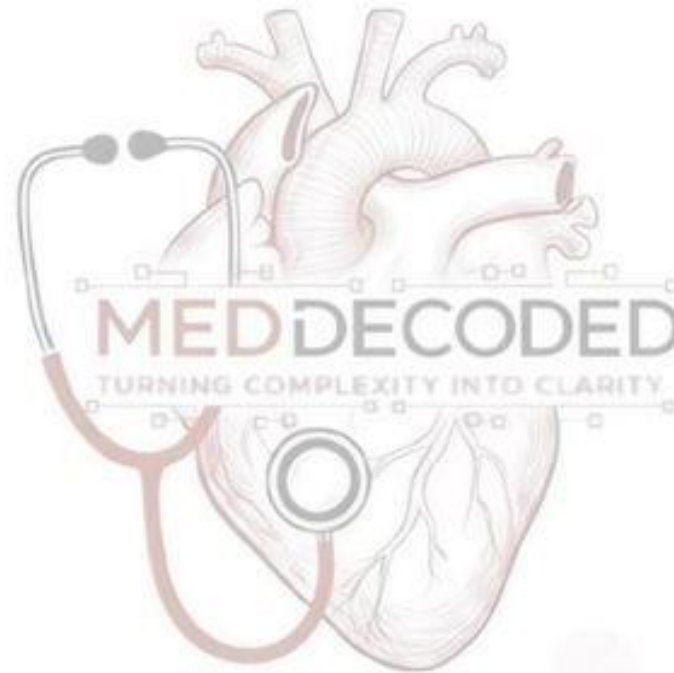
- A. Mannitol
- B. D2O alone
- C. Evans blue
- D. Inulin and D2O
- E. Inulin and radioactive albumin



Answer: E

16. Renin is released by the Juxtaglomerular cells. The end result of its release helps to control which of the following ion levels in the blood is?

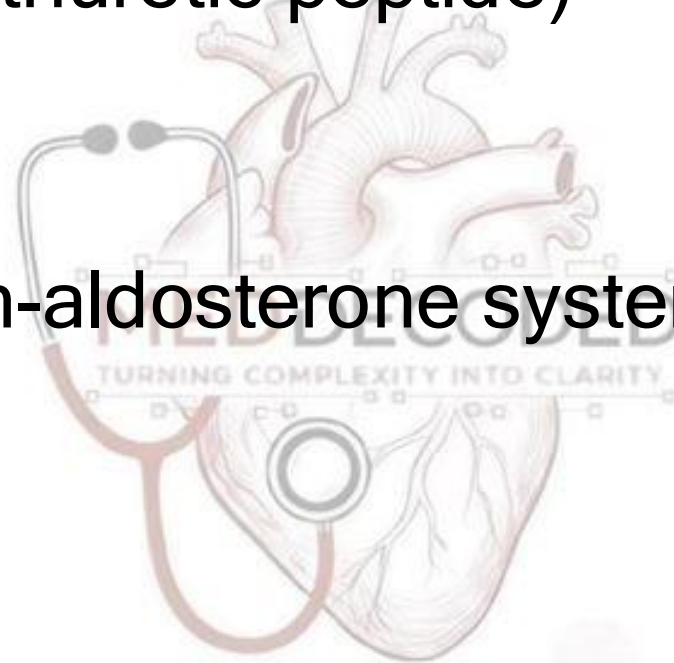
- A. Calcium
- B. Magnesium
- C. Chloride
- D. Hydrogen
- E. Sodium



Answer: E

17. 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

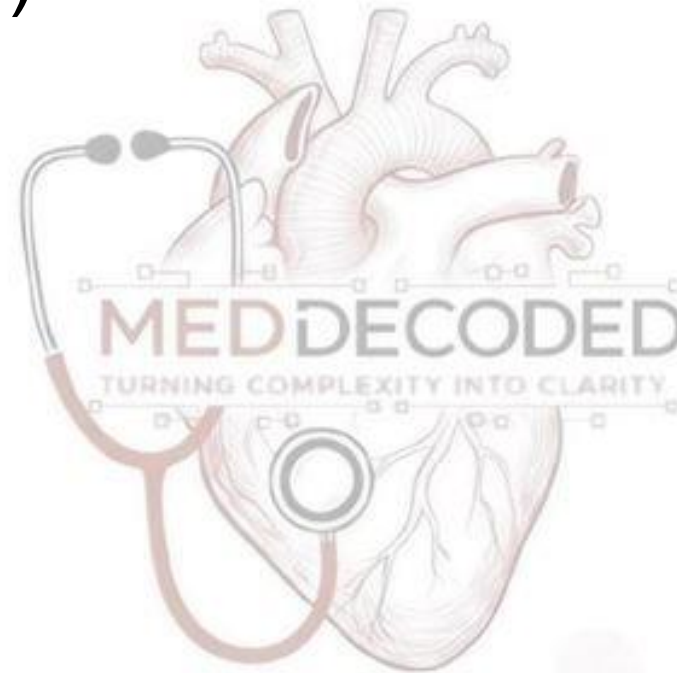


18. Which of the following is NOT true with regard to body fluids ?

- A. Higher Na^+ 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^+ is found in plasma and interstitial fluids

19. Which of the following hormones inhibits Renin release?

- A. Atrial Natriuretic Peptide (ANP)
- B. Brain Natriuretic Peptide (BNP)
- C. Angiotensinogen
- D. Angiotensin II



20. 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.

21. Use the following to answer the question below:

1. Diabetes Insipidus (Deficiency of ADH)
2. Increased Antidiuretic hormone (ADH) secretion
3. Intravenous Infusion of hypotonic solution
4. Drinking high amounts of portable (normal) water
5. Increased release of Aldosterone

which conditions are having highest potential to cause hypernatremia in extracellular fluids with dehydration of cells?

A: 2 and 3 C : 2 and 5

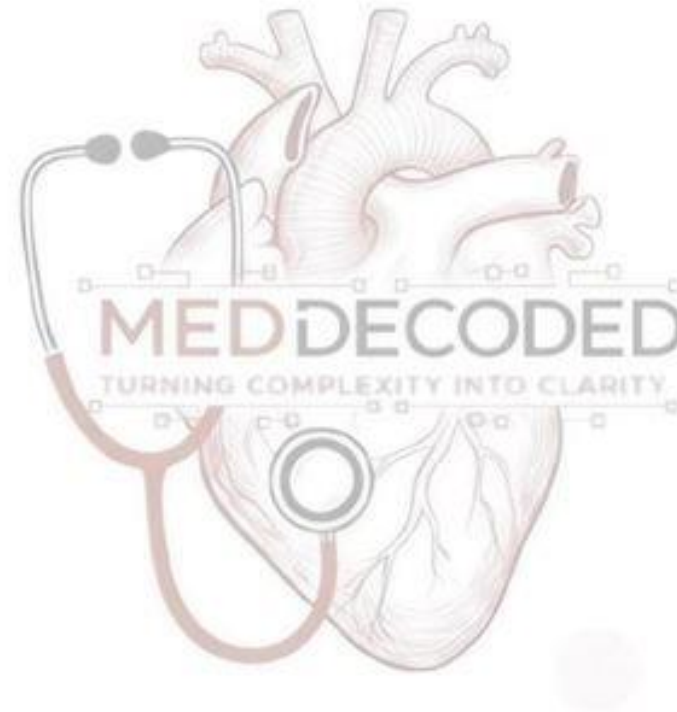
B : 1 and 5 D : 3 and 5

22. ALL ARE properties of tracers used for calculation of volumes EXCEPT:

- A. Be nontoxic
- B. Be rapidly and evenly distribute throughout the nominated compartment not enter any other compartment.
- C. Be metabolized during the equilibration period
- D. Not be excreted during the equilibration period
- E. Easy to measure

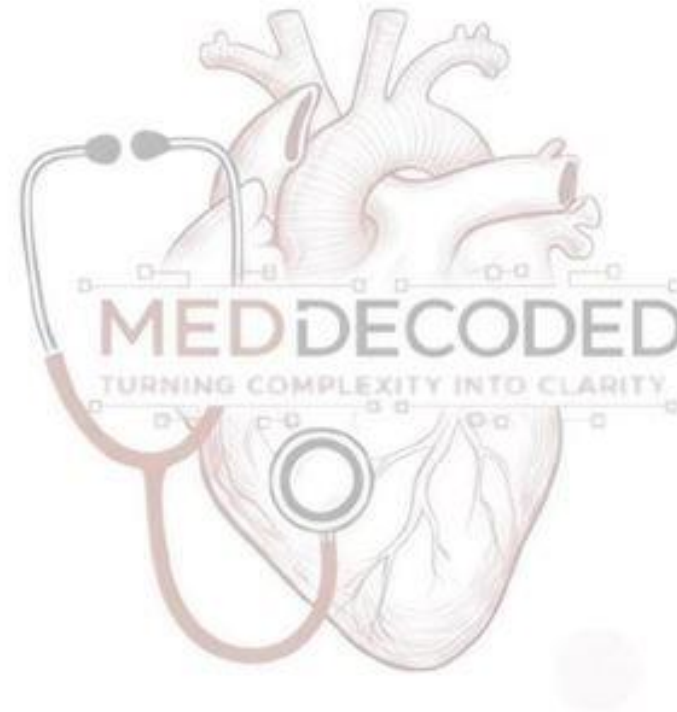
23. From which structure is ADH released on response to Angiotensin II?

- A. Anterior pituitary
- B. Hypothalamus
- C. Adrenal glands
- D. Posterior pituitary



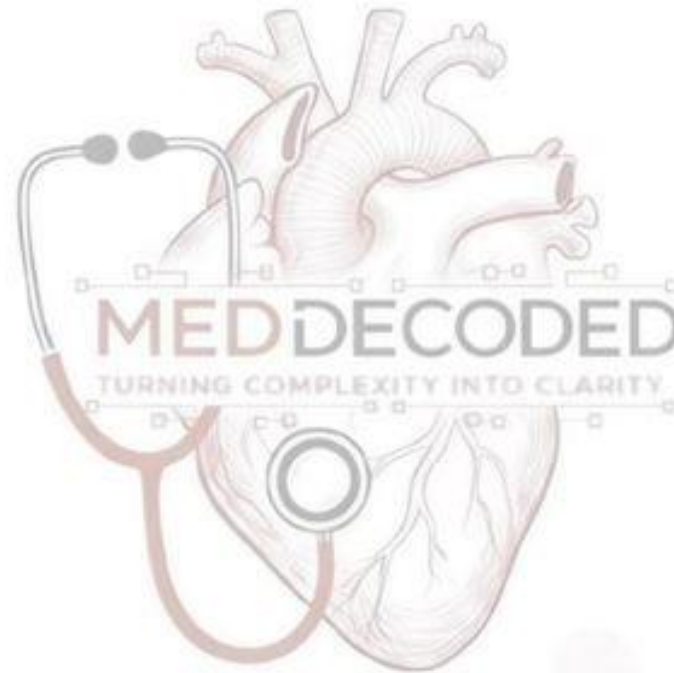
24. Which hormone is released from the adrenals following the binding of Angiotensin II?

- A. Cortisol
- B. Aldosterone
- C. ADH
- D. ACTH



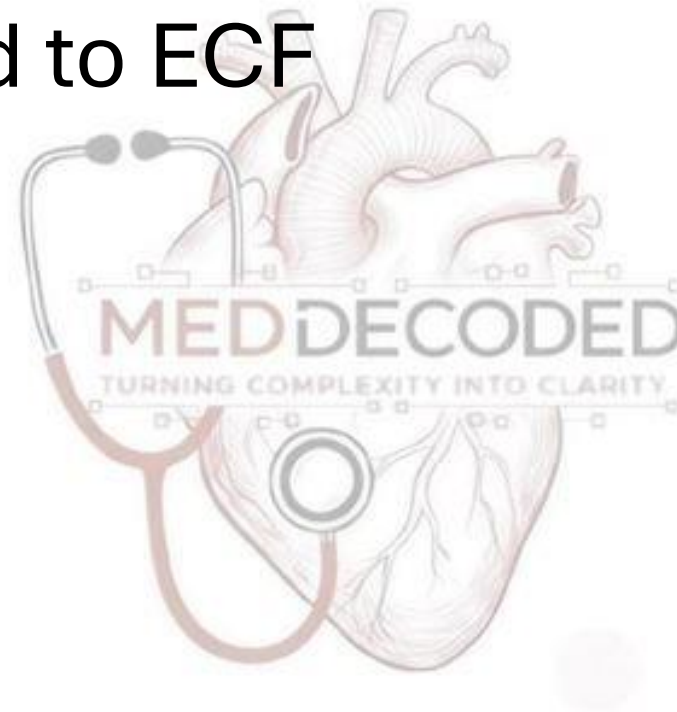
25. What part of the brain is responsible as the control center for the thirst mechanism?

- A. Thalamus
- B. Hypothalamus
- C. Pituitary gland
- D. Renal cortex



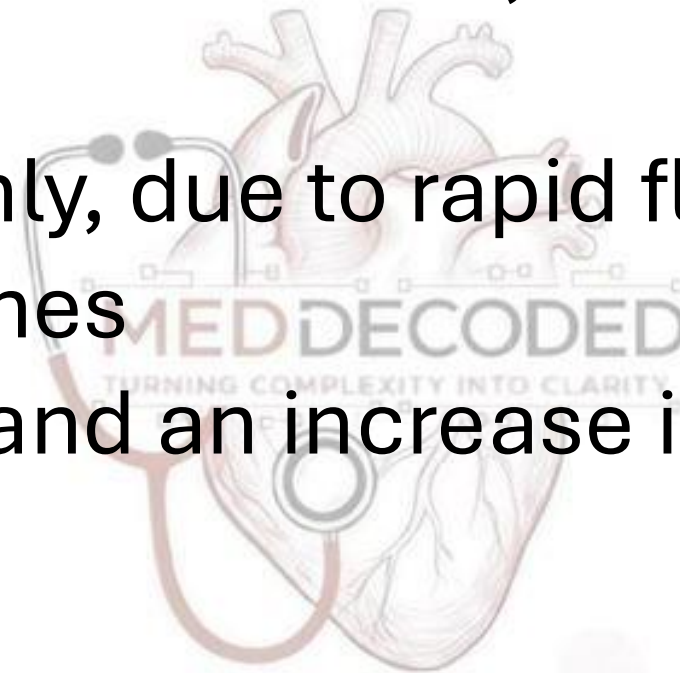
26. One possible cause of cell dehydration is:

- A) Deficiency of aldosterone secretion
- B) Excess intake of salts
- C) Hypotonic solution added to ECF



27. Intake of an isotonic solution will cause:

- A. Increase of ECF volume only
- B. Increase in both ICF and ECF volumes, with a decrease in total osmolarity
- C. Increase of ICF volume only, due to rapid fluid shifting across cell membranes
- D. Decrease of ECF volume and an increase in plasma osmolarity

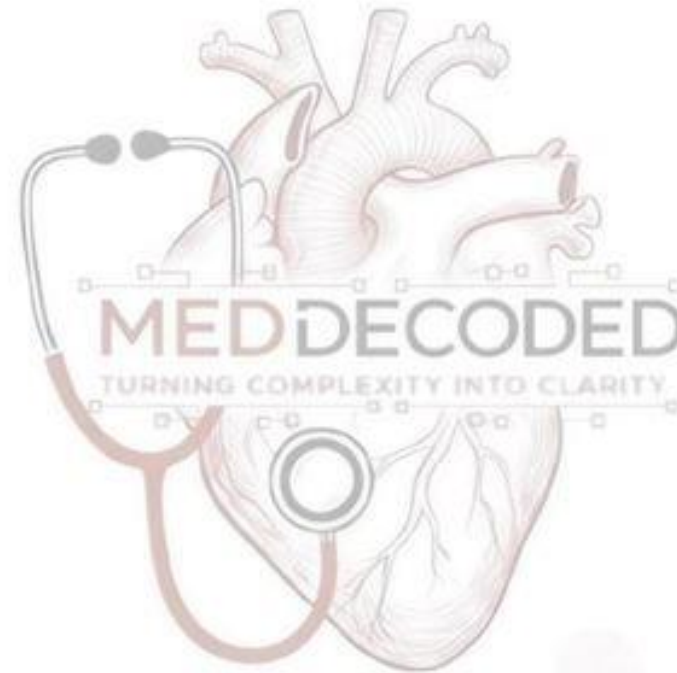


Conduction System of the Heart

(49) Questions

1. Which of the following is the pacemaker of the heart?

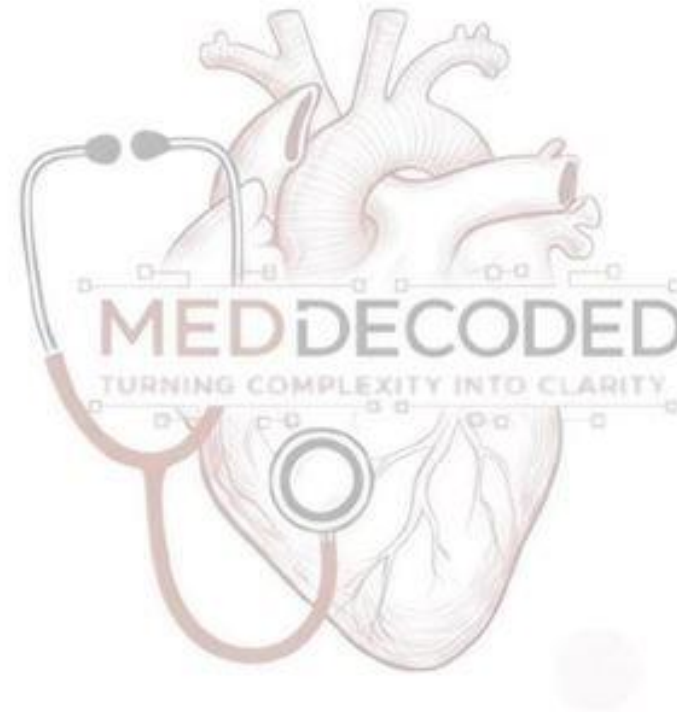
- A. AV node
- B. Bundle of His
- C. Bundle branches
- D. SA node
- E. Purkinje fibers



Answer: D

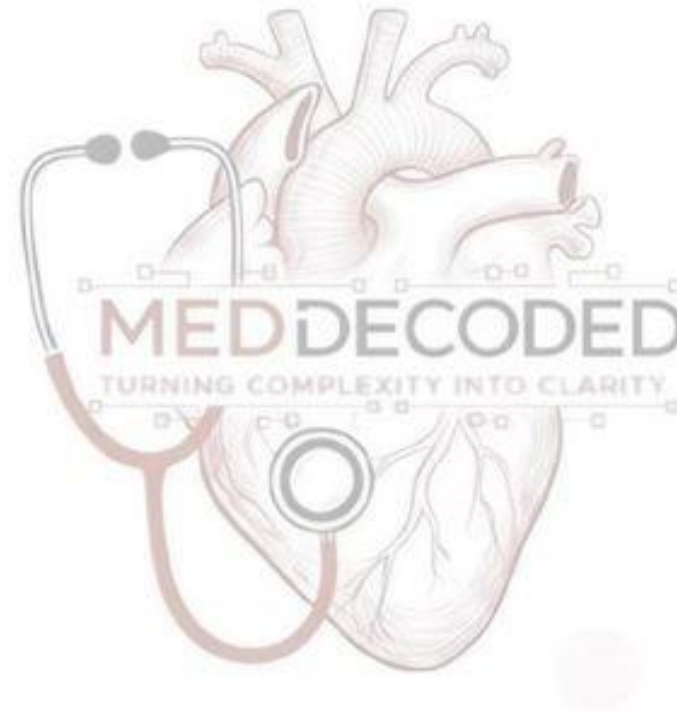
2. In resting conditions, which of the following channels are most likely open in cardiac myocytes (muscle cells).

- A. Na^+
- B. K^+
- C. Ca^{++}
- D. Cl^-

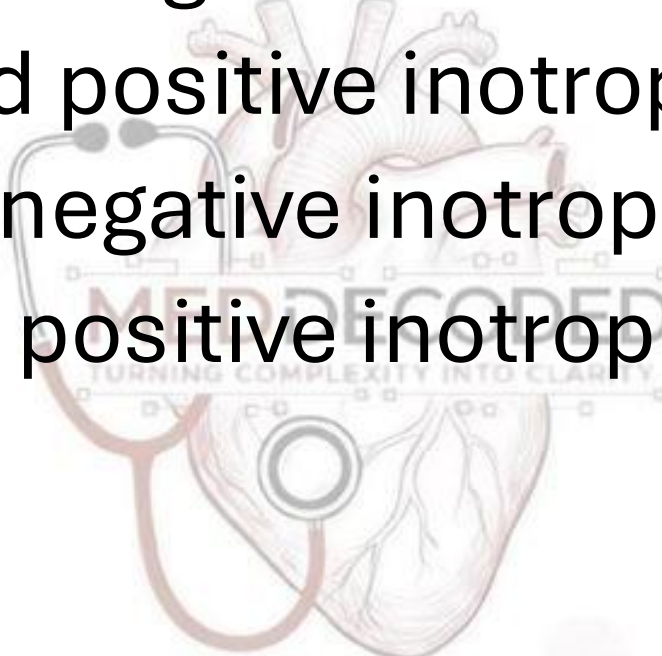


3. If the ventricular Purkinje fibers become the pacemaker of the heart, what is the expected heart rate?

- A. 30 bpm
- B. 65 bpm
- C. 75 bpm
- D. 50 bpm
- E. 85 bpm

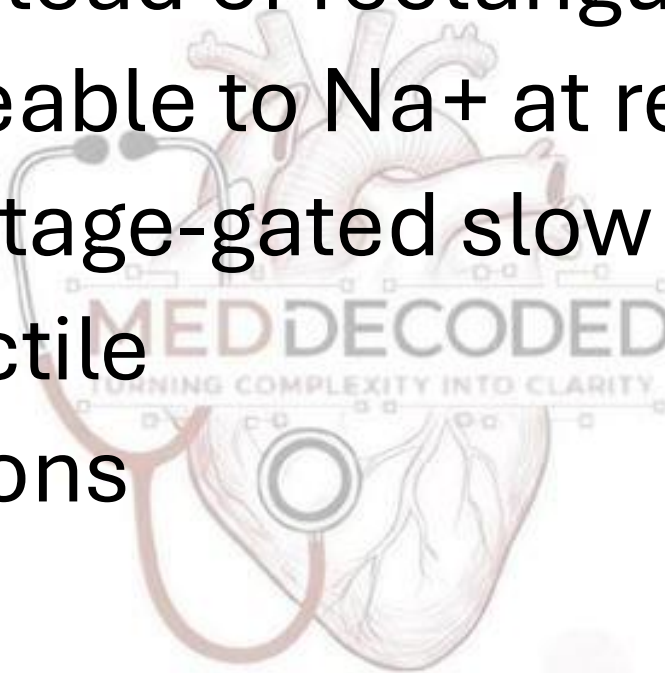


Answer: A

4. Parasympathetic stimulation of the heart leads to:
- A. Negative chronotropic but almost no inotropic action
 - B. 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
- 

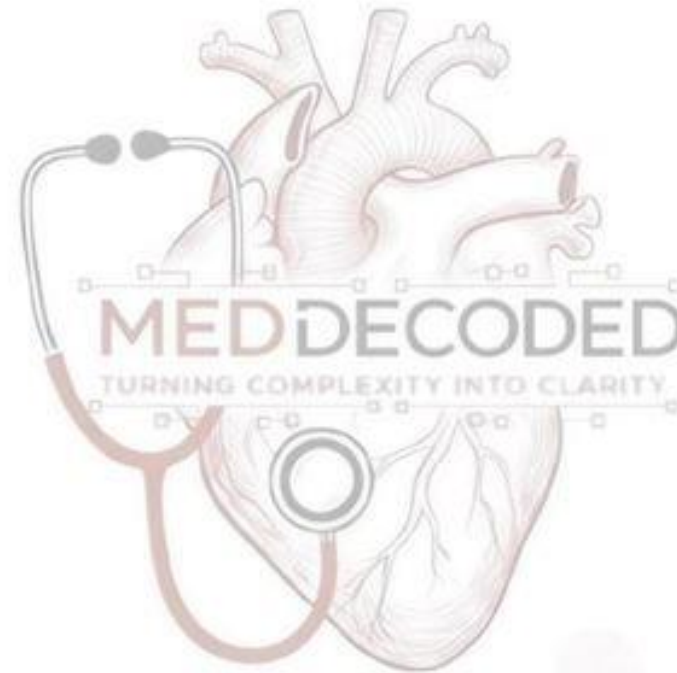
5. The sinoatrial node and atrioventricular are autorhythmic because:

- A. Their cells are rounded instead of rectangular
- B. Their cells are more permeable to Na^+ at rest
- C. Their cells have a lot of voltage-gated slow Ca^{++} channels
- D. Their cells are non-contractile
- E. Their cells are leaky to anions



6. In which phase of the ventricular muscle AP is the potassium permeability the highest?

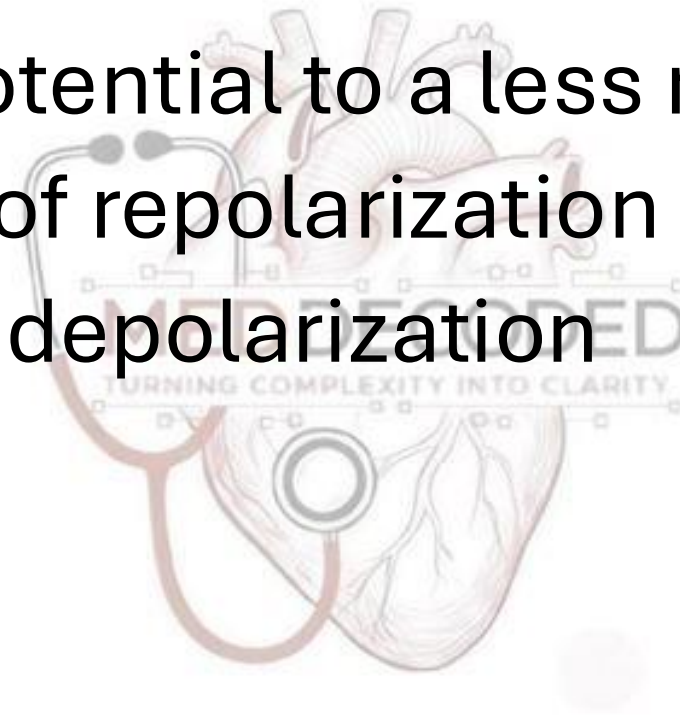
- A. 0
- B. 1
- C. 2
- D. 3
- E. 4



Answer: D

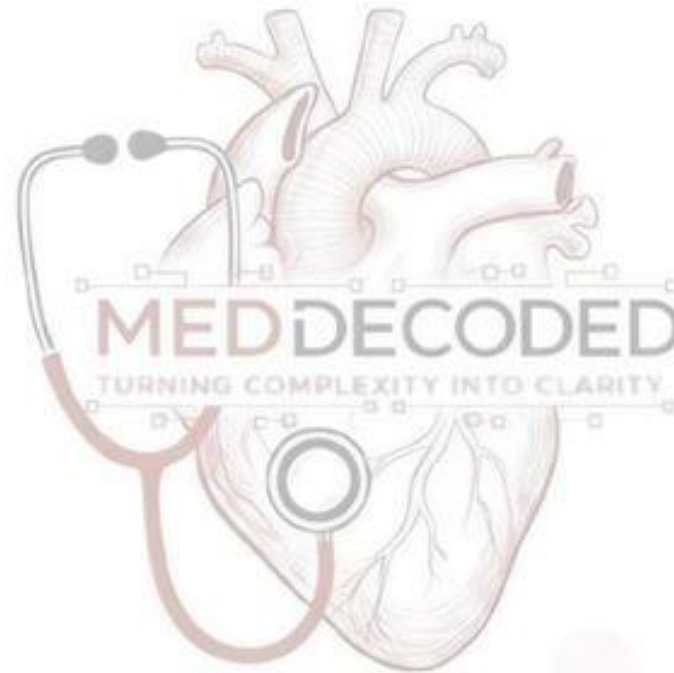
Q7: Which of the following is the mechanism by which the sympathetic nervous system increases the heart rate?

- A. Lower or more negative shift in RMP
- B. Changing the threshold potential to a less negative value
- C. Greater absolute amount of repolarization
- D. Increasing rate of phase 4 depolarization



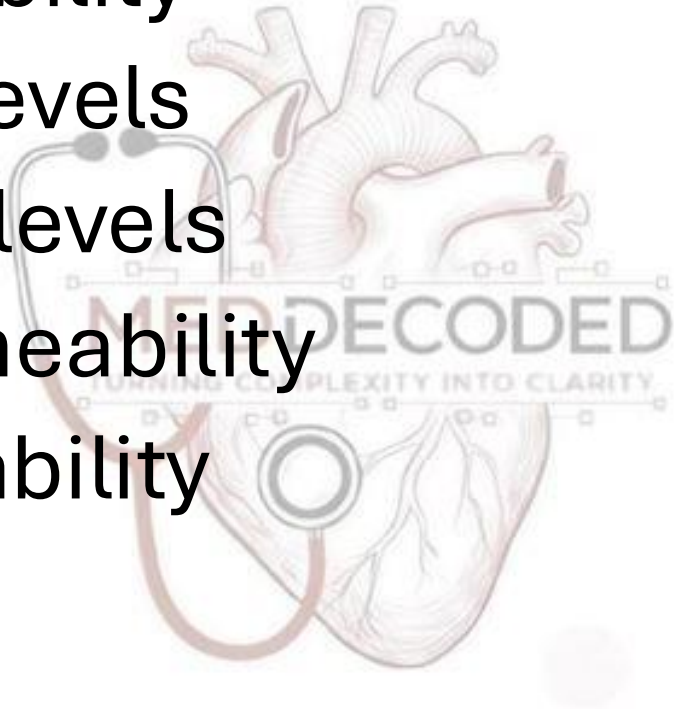
8. Which of the following is the depolarization phase of the AP in pacemaker cells?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4



Answer: A

9. Which condition at the AV node will cause a decrease in heart rate?

- A. Increased sodium permeability
 - B. Decreased acetylcholine levels
 - C. Increased norepinephrine levels
 - D. Increased potassium permeability
 - E. Increased calcium permeability
- 

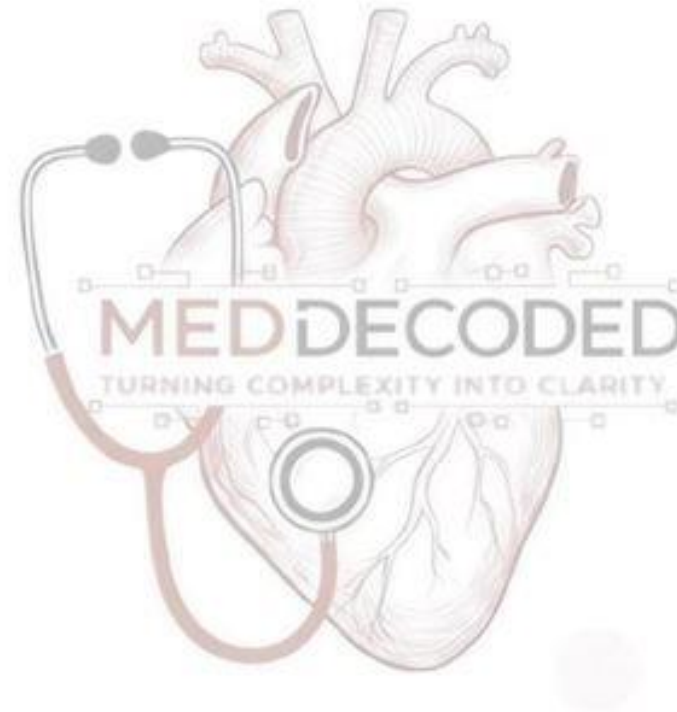
Answer: D

10. A drug that increases the permeability of cardiac cells to Na^+ and Ca^{++} but decreases its permeability to K^+ and Cl^- would cause:

- A. Negative chronotropic and negative inotropic effect on the heart
- B. No effect since the effect of Ca^{++} and Na^+ would be counterbalanced by the effect of Cl^- and K^+
- C. Positive chronotropic and negative inotropic effect on the heart
- D. Positive inotropic and Positive chronotropic effect on the heart
- E. Positive inotropic and negative chronotropic effect on the heart

11. In the case of SSS, the pacemaker becomes:

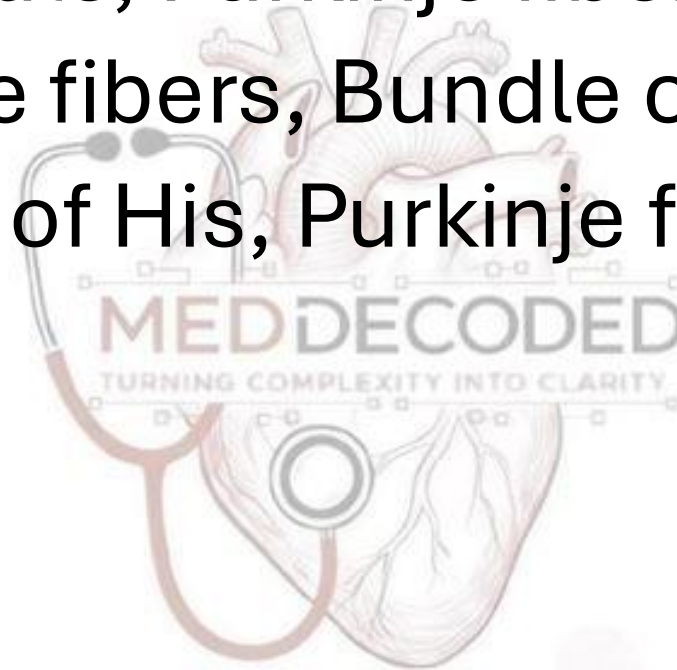
- A. Bundle of His
- B. SA node
- C. AV node
- D. Purkinje fibers



Answer: C

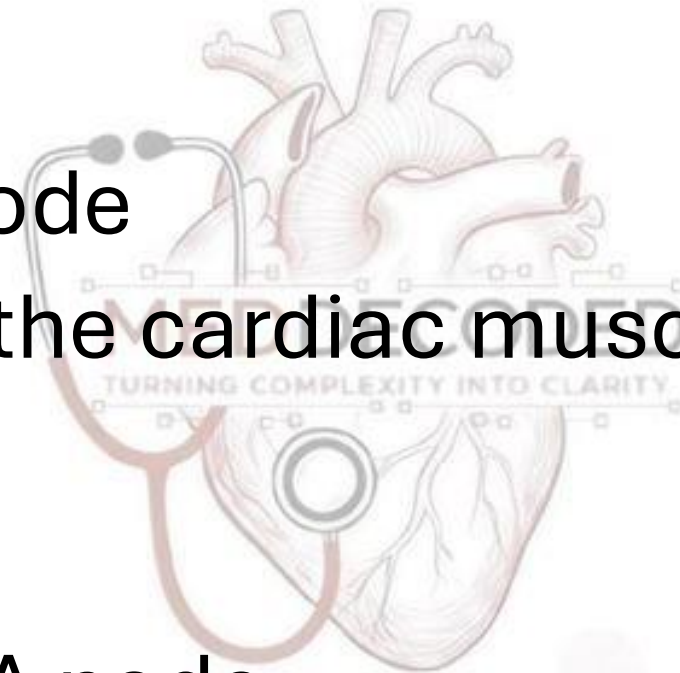
12. The correct order of AP transmission steps is:

- A. SA node, Bundle of His, AV node, Purkinje fibers
- B. AV node, SA node, AV bundle, Purkinje fibers
- C. SA node, AV node, Purkinje fibers, Bundle of His
- D. SA node, AV node, Bundle of His, Purkinje fibers



13. Which of the following is caused by acetylcholine?

- A. Decreased permeability of the SA node to potassium ions
- B. Depolarization of the AV node
- C. Increased permeability of the cardiac muscle to calcium ions
- D. Increased heart rate
- E. Hyperpolarization of the SA node

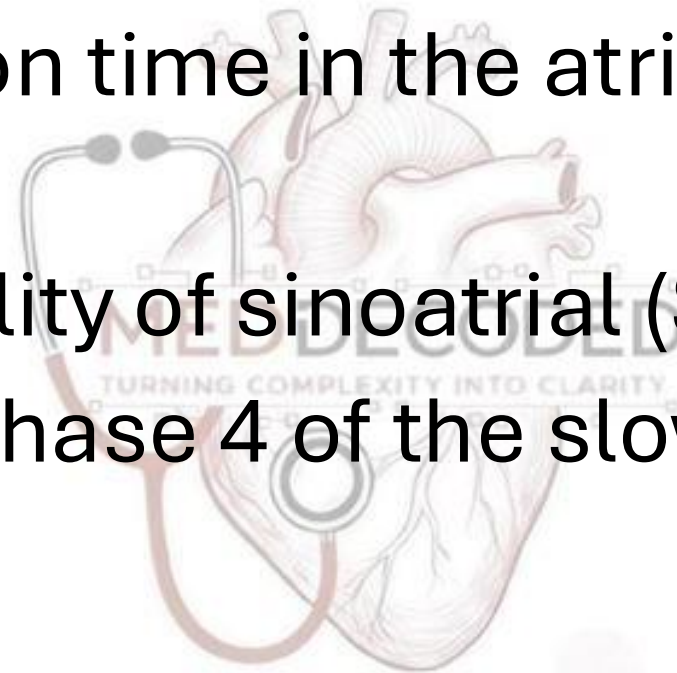


14. About the refractory period in the heart, all the following are true EXCEPT:

- A. It is longer than the refractory period in neurons
- B. It lasts approximately as long as the cardiac contraction
- C. It is due mainly to phase 2 (plateau) of the contractile cardiac muscle action potential
- D. During it, the heart cannot be stimulated
- E. It corresponds in time with the whole duration of the action potential

15. Sympathetic stimulation causes all of the following in the heart EXCEPT:

- A. It has a positive inotropic action on the heart
- B. It decreases the conduction time in the atrioventricular (AV) node
- C. It decreases the permeability of sinoatrial (SA) node to K^+
- D. It decreases the slope of phase 4 of the slow response potential of the SA node
- E. It increases the heart rate



16. Myocardial contractility is best correlated with the intracellular concentration of:

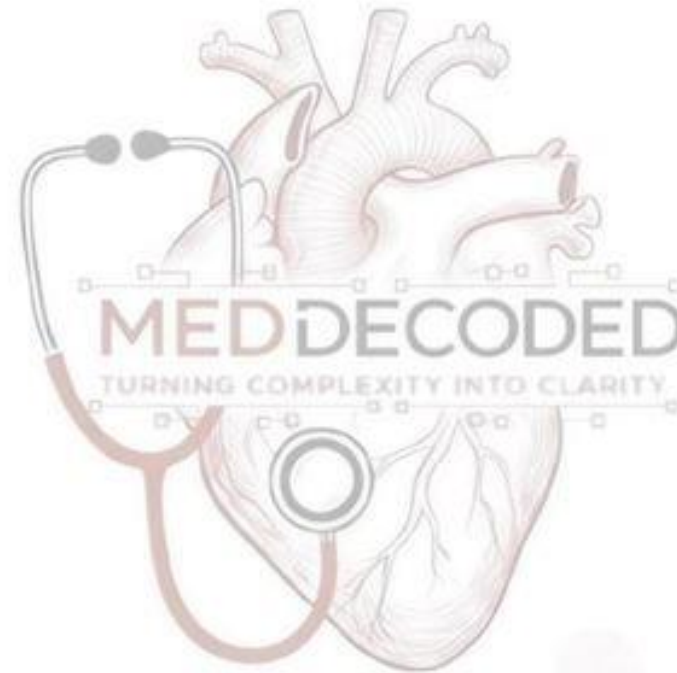
A. HCO_3^-

B. Na^+

C. Ca^{++}

D. K^+

E. Cl^-



Answer: C

17. 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 lower than ventricular cell phase 0
- D. Ca^{++} ions is responsible for phase 2
- E. It has more negative resting membrane potential than ventricular cell potential

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

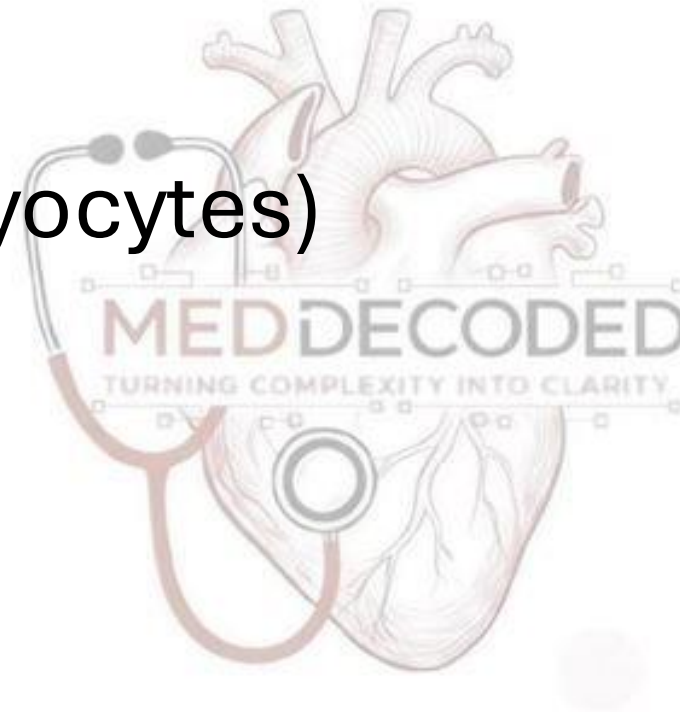
- A. The chemical gradient for Ca^{++} tends to move this ion inside
- B. The electrochemical gradient for K^+ tends to move this ion inside
- C. Na^+ permeability greatly increases
- D. This phase is responsible for the short refractory period of cardiac action potential
- E. The chemical gradient for K^+ tends to move this ion inside

19. Which of the following is NOT caused by Sympathetic stimulation:

- A. Increase in the heart rate
- B. Decrease of the permeability of the sinoatrial node to K^+
- C. Positive inotropic effect
- D. Decrease of the slope of the slow depolarization phase of the pacemaker potential
- E. Increase of the conduction of the atrioventricular phase

20. The cardiac tissue with the slowest autorhythmicity is the:

- A. AV bundle cells (myocytes)
- B. SA node
- C. Purkinje fibers
- D. Bundle branches cells (myocytes)
- E. AV node

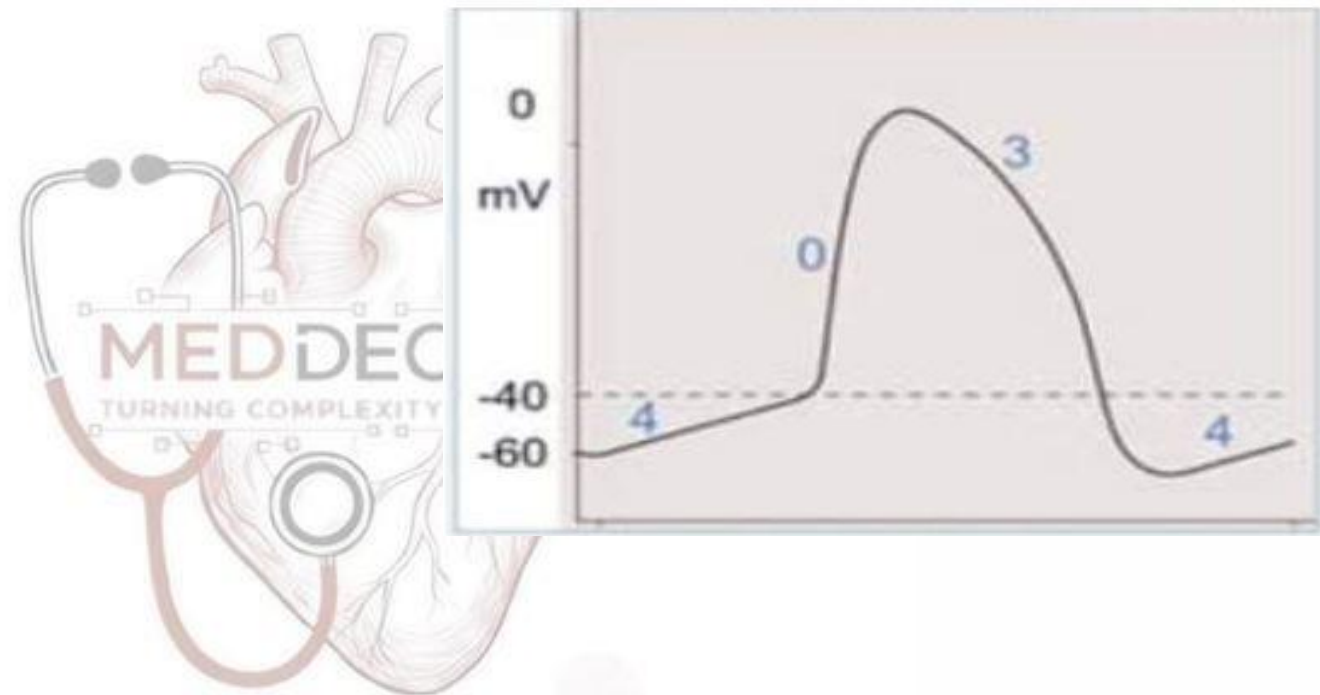


21. Sinoatrial node cells are characterized by one of the following:

- A. Able to generate intrinsic and rhythmic impulses because their membrane potential is unstable.
- B. Unable to generate impulses when completely denervated.
- C. Innervated by the vagus (parasympathetic) only.
- D. Connected to the AV node by fine bundles of Purkinje tissue.
- E. Found in both atria.

22. The curve below represents the slow response action potential of the sinoatrial node of the conduction system. Which of the following phases is due to leakage of Na^+ ions?

- A. 4
- B. 0
- C. 3
- D. 4 & 0
- E. None of the above



23. Sympathetic stimulation of the heart normally causes which of the following conditions?

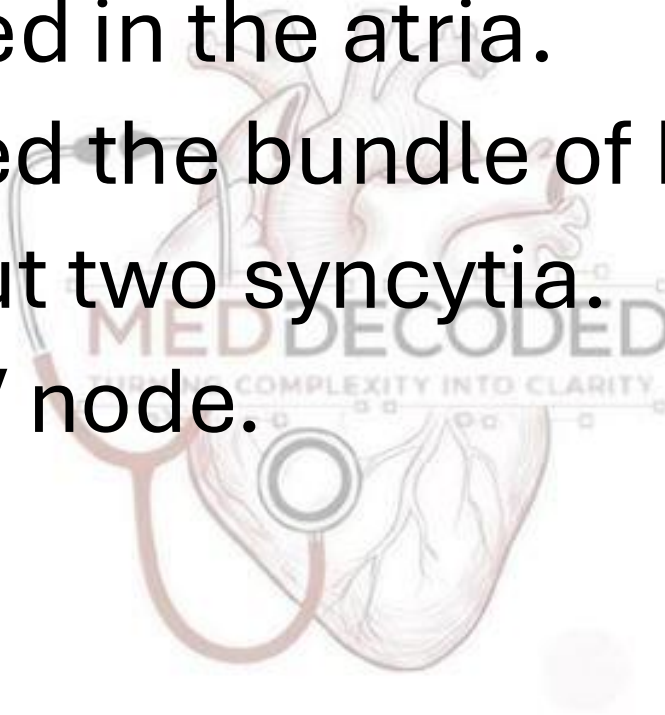
- A. Decreased force of contraction (negative inotropic) of the atria.
- B. Decreased rate of conduction (negative dromotropic effect) of the cardiac impulse.
- C. Acetylcholine release at the sympathetic endings.
- D. Negative chronotropic effect on the heart rate.
- E. Increased force of contraction (positive inotropic) of the ventricles.

24. The SA node is the pacemaker of the heart because:

- A. Leakier to K^+ than other cells.
- B. It is the only cells leaky to Na^+ in the heart.
- C. Its membrane property (reach threshold faster than any other cell).
- D. Its location in the right atrium between the venae cava.
- E. It is connected to autonomic nervous system.

25. Which of the following is true about the heart?

- A. All parts contract simultaneously.
- B. Purkinje fibers are located in the atria.
- C. The AV node is also called the bundle of His.
- D. The heart has not one but two syncytia.
- E. The pacemaker is the AV node.



26. All of the following are true about cardiac muscles EXCEPT:

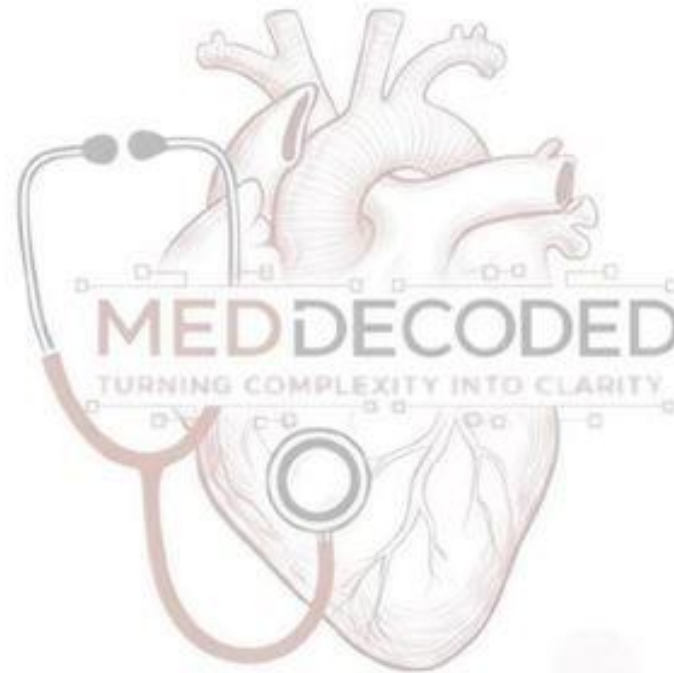
- A. They have a plateau (phase 2).
- B. Their depolarization (phase 0) is very fast.
- C. They have stable RMP.
- D. Transient potassium (I_{To}) current is responsible for phase 3.
- E. They are excitable cells.

Answer: D

The I_{To} is responsible for phase 1 not 3 (there is another current for 3)

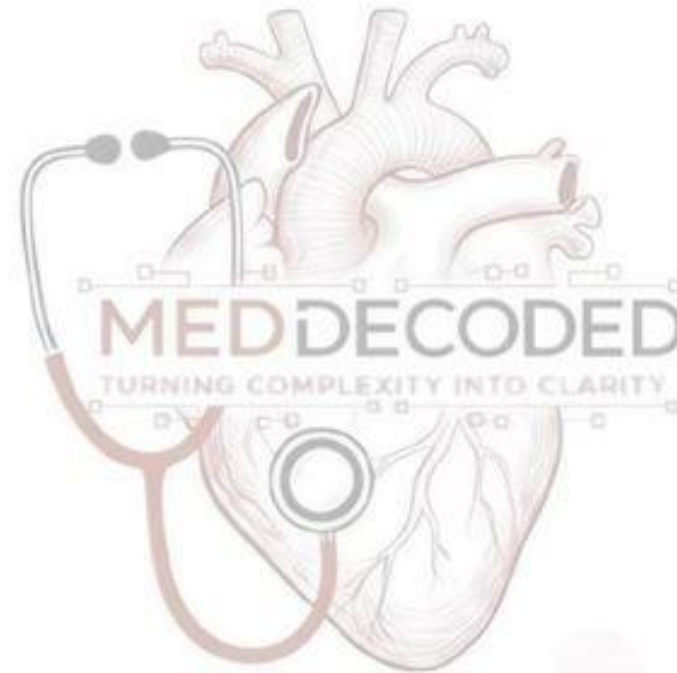
27. Which of the following cases is responsible for the refractory period (closed and inactive)?

- A. The m gate open
- B. The h gate open
- C. Both gates closed
- D. m gate closed
- E. h gate closed



28. The ratio of intracellular concentration of Ca^{++} to its extracellular concentration is:

- A. 0.01
- B. 0.001
- C. 0.0001
- D. 1000
- E. 10000

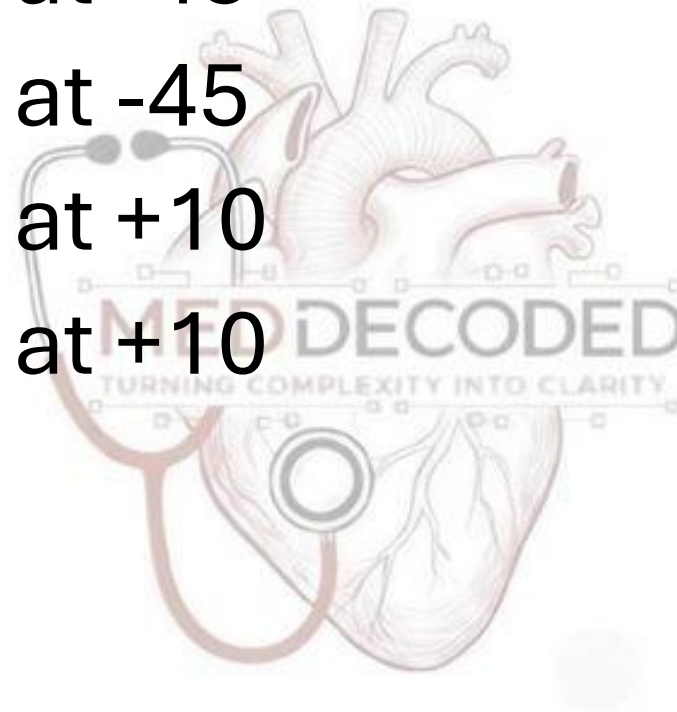


Answer: C

The concentration of free Ca^{2+} inside the cell is extremely low ($\sim 10^{-7}$ M), while the extracellular concentration is much higher ($\sim 10^{-3}$ M) so the intracellular-to-extracellular calcium concentration ratio is approximately 0.0001 .

29. The sodium funny channels in SRAP cells:

- A. Opens at -60 and closes at -50
- B. Opens at -60 and closes at -45
- C. Opens at -90 and closes at -45
- D. Opens at -90 and closes at +10
- E. Opens at -60 and closes at +10

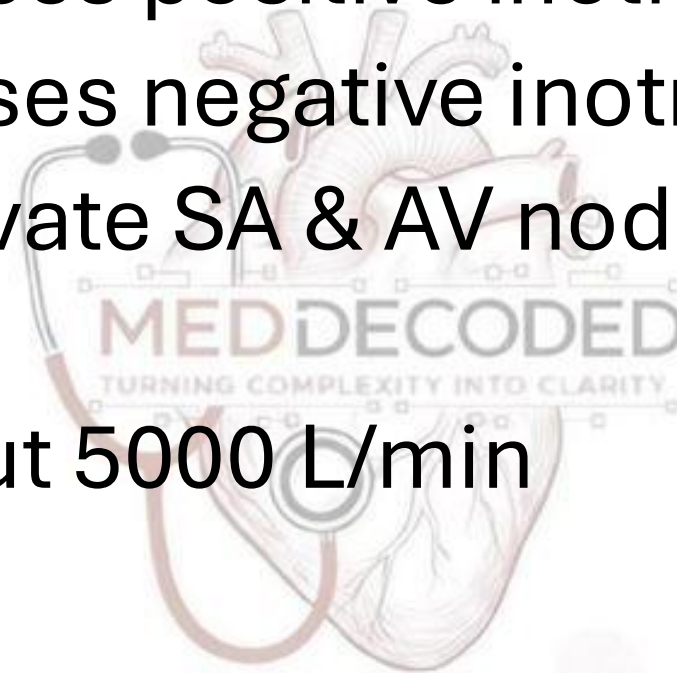


The doctor didn't mention the SRAP (slow response action potential) and FRAP (fast response action potential) but it came in past years' exams
Briefly, SRAP are the cardiac muscle cells responsive for conduction (SA node, AV node, etc) and FRAP are cardiac contractile cells (ventricular myocytes)

Answer: A

30. Which of the following is true?

- A. Cardiac output always increases with heart rate
- B. The vagal stimulation causes positive inotropic effect
- C. The vagal stimulation causes negative inotropic effect
- D. Sympathetic nerves innervate SA & AV nodes as well as the ventricles
- E. The cardiac output is about 5000 L/min



Answer: D

31. All the following are common feature between SA nodal cells and AV nodal cells EXCEPT:

- A. a negative resting membrane potential (AP).
- B. Ca^{++} is involved in AP generation.
- C. both are excitable cells.
- D. both are autorhythmic cells.
- E. both have the same slope of phase (4) of action potential

32. Regarding syncytium, all the following are true except:

- A. cells are excited together.
- B. cells are excited separately (individualistics).
- C. in th heart, we have two syncytia.
- D. ubon stimulation of one ventricular cell, leads to stimulation of both ventricles.
- E. gap junctions between the cells are

33. Tetanic contraction of the cardiac cell is due to all the following EXCEPT :

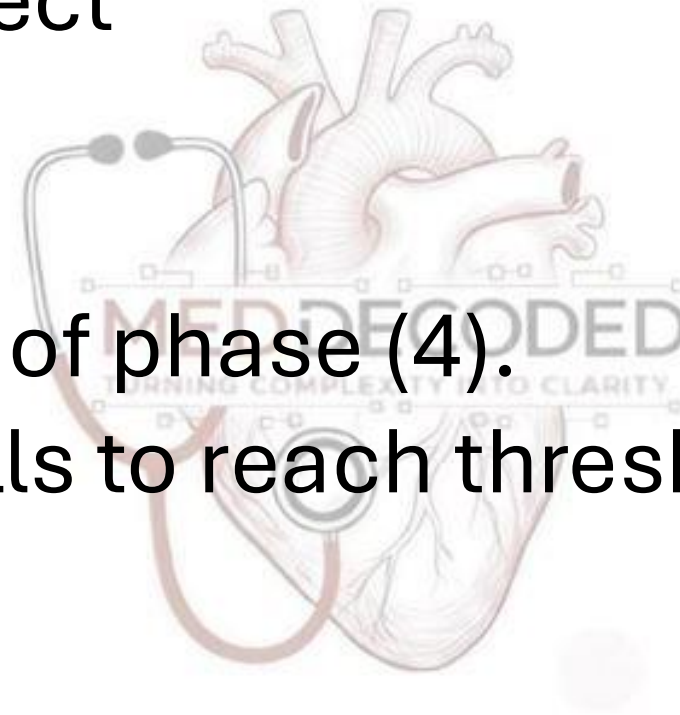
- A. Because of presence of phase (2) in cardiac cell's AP.
- B. Because there is no mitochondria in the cardiac cells.
- C. Because of the prolonged action potential duration.
- D. Because muscle twitch duration is less than action potential duration.
- E. because of calcium influx during the plateau phase.

34. At the peak of an action potential in the SA nodal cells (end of phase “0”) one of the following is true:

- A. the membrane potential equals Na^+ equilibrium potential
- B. the chemical gradient for K^+ tends to move this ion inside.
- C. Na^+ permeability greatly increases.
- D. the membrane potential equals Ca^{++} equilibrium potential
- E. the chemical gradient for Na^+ still tends to move this ion inside.

35. Norepinephrine acts on the SA nodal cells causing all the following EXCEPT:

- A. positive chronotropic effect
- B. tachycardia
- C. shorter phase (4).
- D. Decreased slope of dV/dt of phase (4).
- E. Becomes easy for the cells to reach threshold.



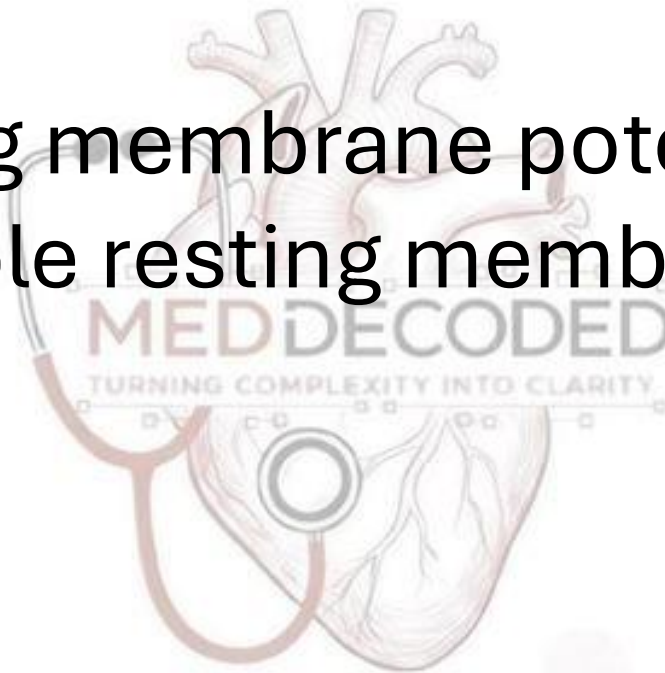
36. At the end of phase 0 of the FRAP cell action potential, which statement is correct?

- A) Influx of K^+ by electrical gradient
- B) Influx of K^+ by chemical gradient
- C) Highest conductance for Na^+
- D) Influx of Ca^{++} by electrical gradient
- E) Influx of Ca^{++} by chemical gradient

Answer: C

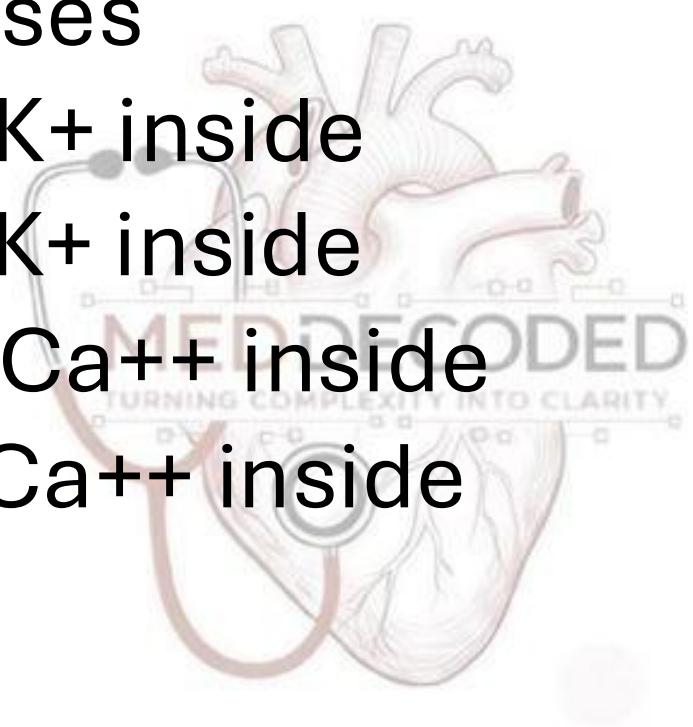
37. Which feature is common to RBCs, smooth muscle cells, and cardiac cells?

- A) They are excitable cells
- B) All of them have a resting membrane potential
- C) All of them have a variable resting membrane potential



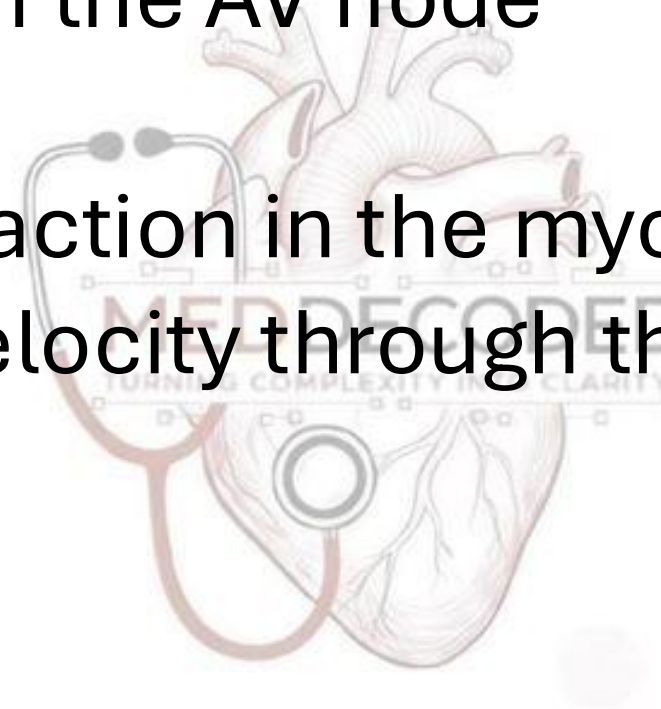
38. At the peak of phase 0 of the action potential, which statement is true?

- A) Na^+ permeability increases
- B) Chemical force pushes K^+ inside
- C) Electrical force pushes K^+ inside
- D) Chemical force pushes Ca^{++} inside
- E) Electrical force pushes Ca^{++} inside



39. Which of the following is NOT an effect of sympathetic activation?

- A. Decreased conduction in the AV node
- B. Increased heart rate
- C. Increased force of contraction in the myocardium
- D. Increased conduction velocity through the Purkinje fibers



Answer: A

A -> parasympathetic(Negative chronotropic effect)

B,C,D -> sympathetic (positive chronotropic effect)

40. All the following are true regarding the AV nodal delay EXCEPT:

- A. The AV nodal delay assures (يؤكد) that the atria contract prior (before) to ventricular systole.
- B. the delay is due to less gap junctions between the neighboring cells
- C. last of about 0.12 sec.
- D. is responsible for the slow conduction velocity in this part of the heart.
- E. their cells show low resistance to electrical current when compared to Purkinje cells.

Answer: E
Exp! The AV node is actually the slowest in conduction because of high resistance due to less gap junctions and smaller diameter, Purkinje are the fastest

41. During phase (4) of ventricular action potential, choose the right statement:

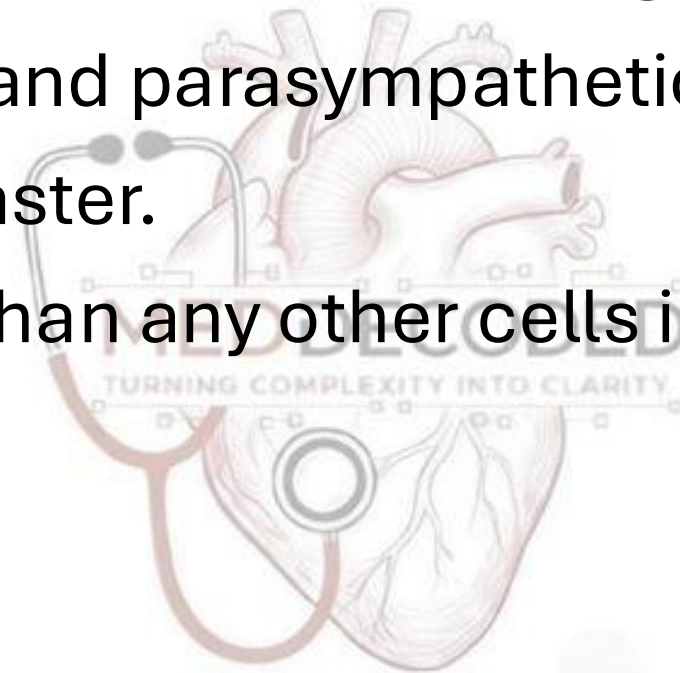
- A. Ca^{++} ions enter ventricular cells during this phase.
- B. the voltage of this phase is stable with respect to time.
- C. K^+ enters the cells through simple diffusion.
- D. during this phase, positive charges entering the cell are more than positive charges leaving the cells
- E. at the end of this phase, the transmembrane potential is closer to Ca^{++} equilibrium potential rather than to Na^+ equilibrium potential.

Answer: B

Exp! Option E is talking about phase 2

42. The SA node is the pacemaker of heart because all of the following EXCEPT

- A. it has the highest dV/dt (slope) of phase (4) among other cardiac cells
- B. its innervated by sympathetic and parasympathetic nerve fibers.
- C. it reaches threshold by itself faster.
- D. it is more leaky to Na^+ at rest than any other cells in the heart.
- E. its membrane property.

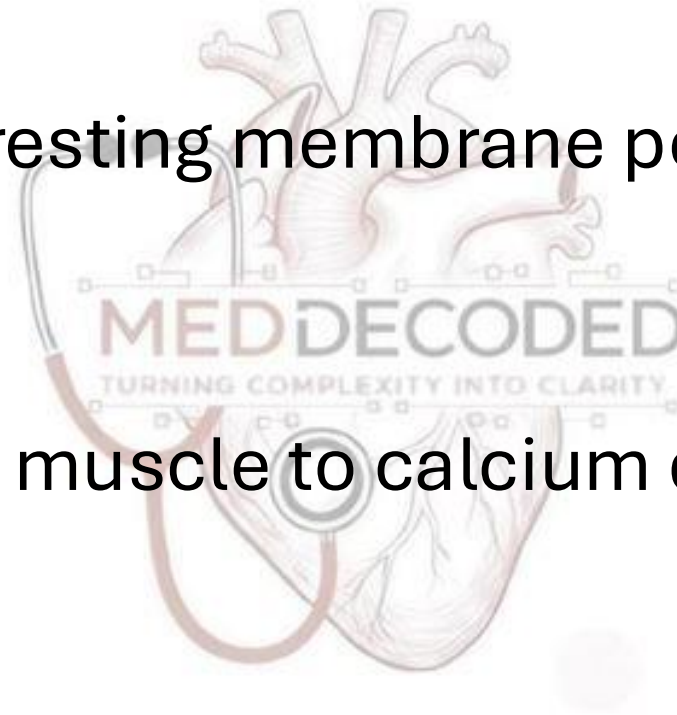


Answer: B

Exp! The SA node is the pacemaker because it can start impulses on its own NOT because nerves control it.
Option B is a correct statement about the SA node, but it is not the reason it is the pacemaker

43. Which of the following best explains how sympathetic stimulation cause tachycardia?

- A. decrease $I(f)$ during phase (4)
- B. increase $I(K^+)$ during phase (4)
- C. The rate of upward drift of the resting membrane potential of the S-A node decreases
- D. reach threshold faster
- E. the permeability of the cardiac muscle to calcium decreases

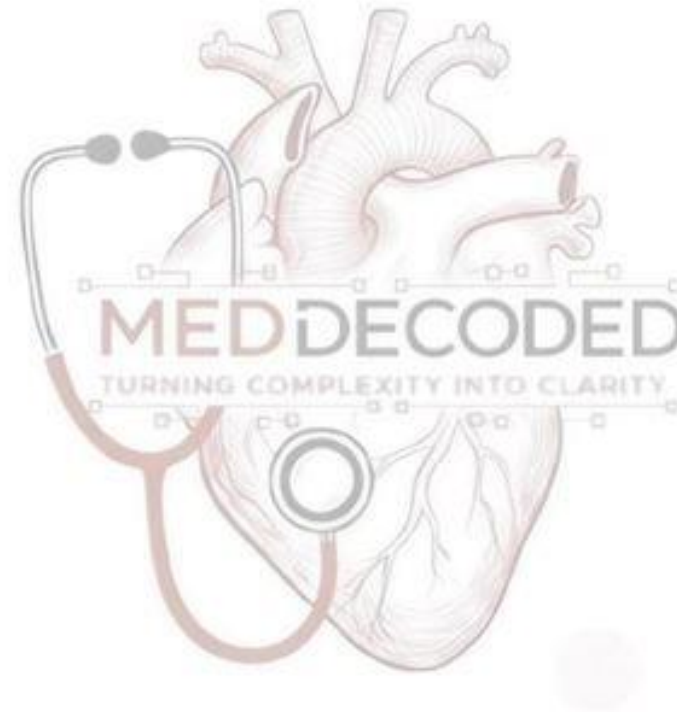


Answer: D

Exp! All others would decrease heart rate

44. If the Purkinje fibers become the pacemaker of the heart, what is the expected heart rate?

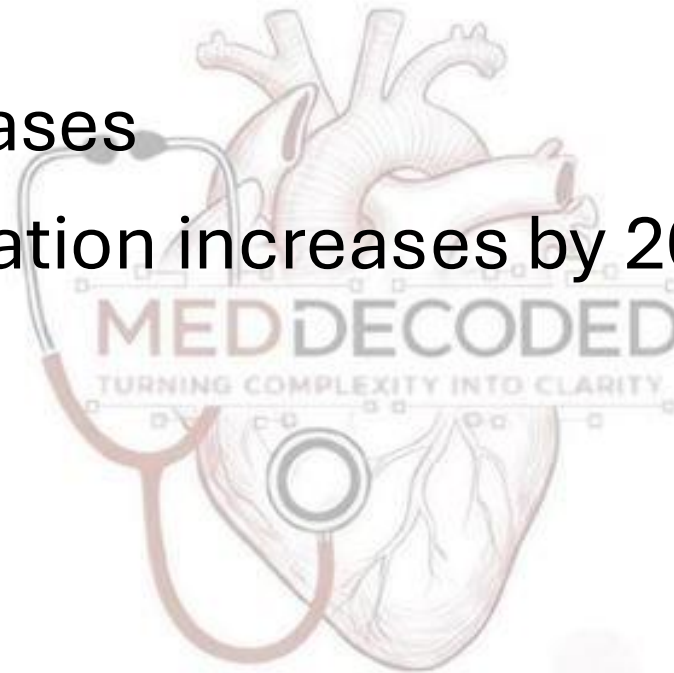
- A. 30 beats/min
- B. 50 beats/min
- C. 60 beats/min
- D. 70 beats/min
- E. 80 beats/min



Answer: A

45. In systemic circulation, as blood travels from capillaries to right atrium:

- A. its pressure increases
- B. its cross sectional area increases
- C. its plasma albumin concentration increases by 20%.
- D. its velocity increases
- E. its flow (ml/min) increases



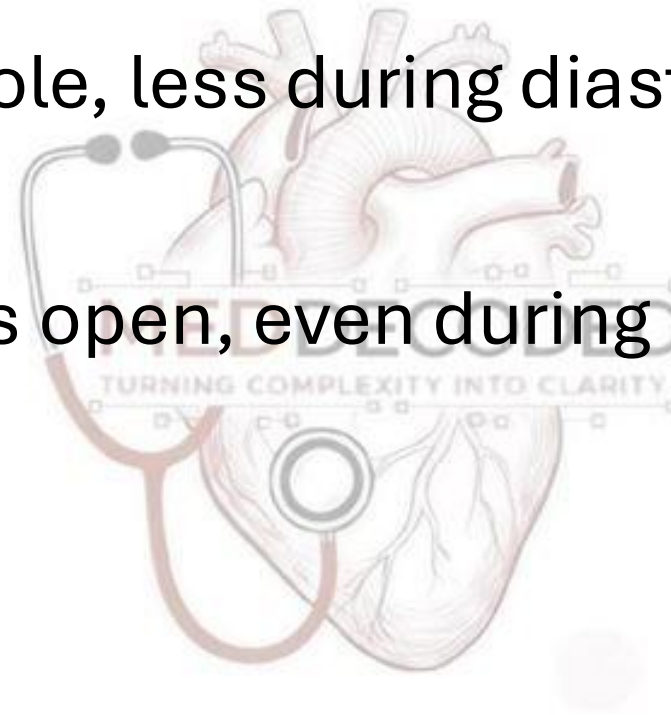
Answer: D

Exp! Dr.Yanal deleted this question, but to explain it, Velocity increases in veins because blood flows through a smaller total cross-sectional area after reconvergence from the capillary bed

It's a law we took in physics if you remember ($Q=V \times A$) ☺

46. Blood flow in the systemic capillaries:

- A. is mainly controlled by the capillary wall constriction and dilatation.
- B. is intermittent
- C. is pulsatile (more during systole, less during diastole)
- D. is continuous
- E. sytemic capillaries are always open, even during rest.



Answer: B

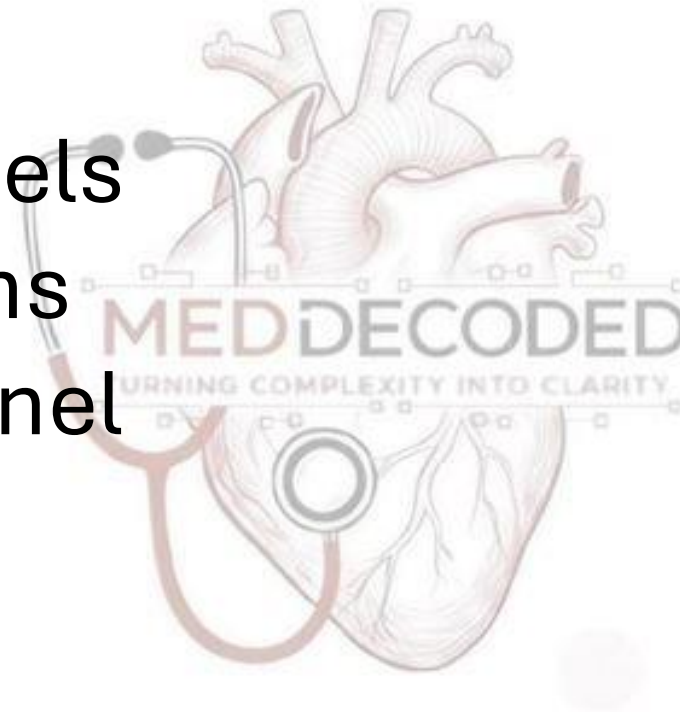
Exp! On the arterial end of a capillary, there is a sphincter (smooth muscle ring that opens and closes), its contraction closes the capillary.

Since the capillary has it, its flow is not pulsatile or continuous but intermittent (in bursts)

Also capillaries don't have muscles to let them constrict or dilate

47. How does calcium (Ca^{++}) enter ventricular cells during phase 2 of their action potential?

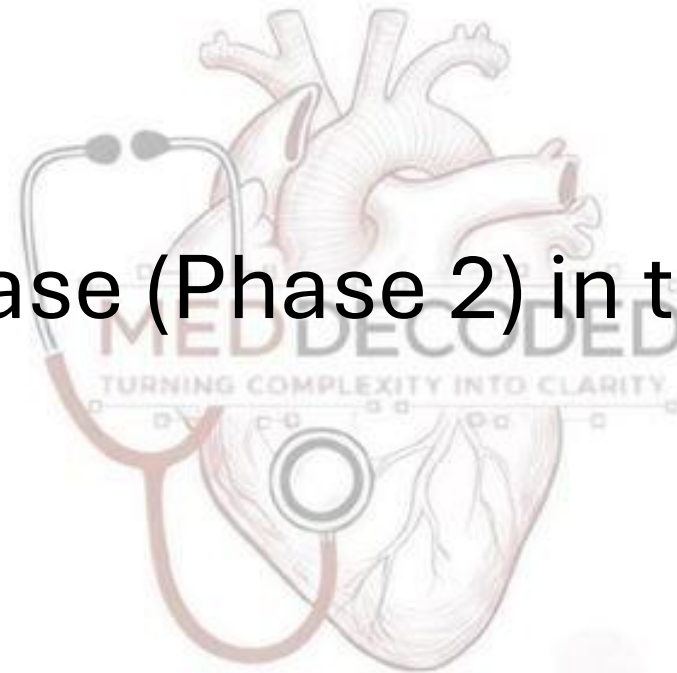
- A) Secondary active transport
- B) Primary active transport
- C) Diffusion via gated channels
- D) Co-transport with Na^+ ions
- E) Potassium-Calcium channel



Answer : C

48. Which of the following properties is NOT true about the ventricles?

- A. Autorhythmicity
- B. High contractility
- C. Long refractory period
- D. Presence of a plateau phase (Phase 2) in their action potential



49. Which of the following statements about phase 2 of the action potential is incorrect?

- A. The positive charges entering are more than the positive charges exiting from the membrane.
- B. It is also known as the plateau phase, which prolongs the cardiac action potential.
- C. Calcium influx occurs through calcium channels during this phase.
- D. It plays a critical role in preventing tetanus in cardiac muscle

Microcirculation and Edema

(43) Questions

1. Listed below are the hydrostatic and oncotic pressures across a muscle capillary wall.

Mean capillary hydrostatic pressure = 25 mmHg.

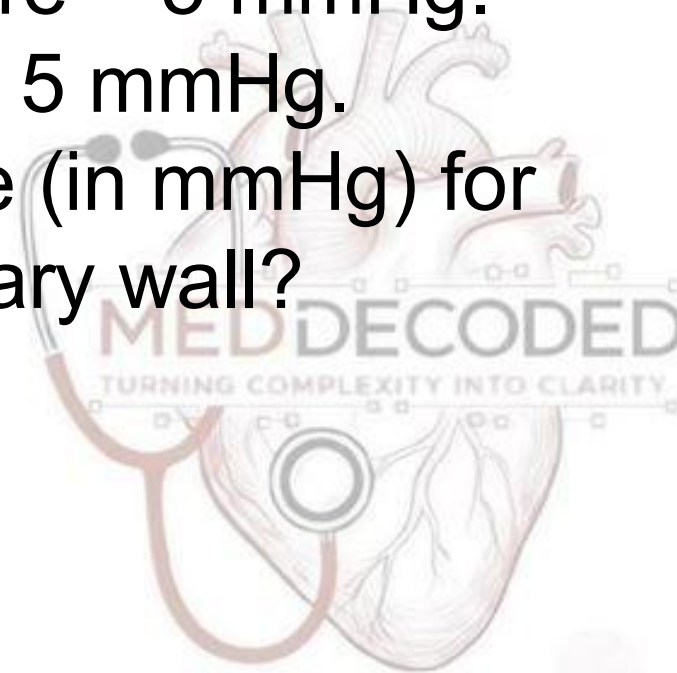
Plasma colloid osmotic pressure = 28 mmHg.

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. No enough information
- B. +7
- C. -7
- D. +3
- E. -3



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

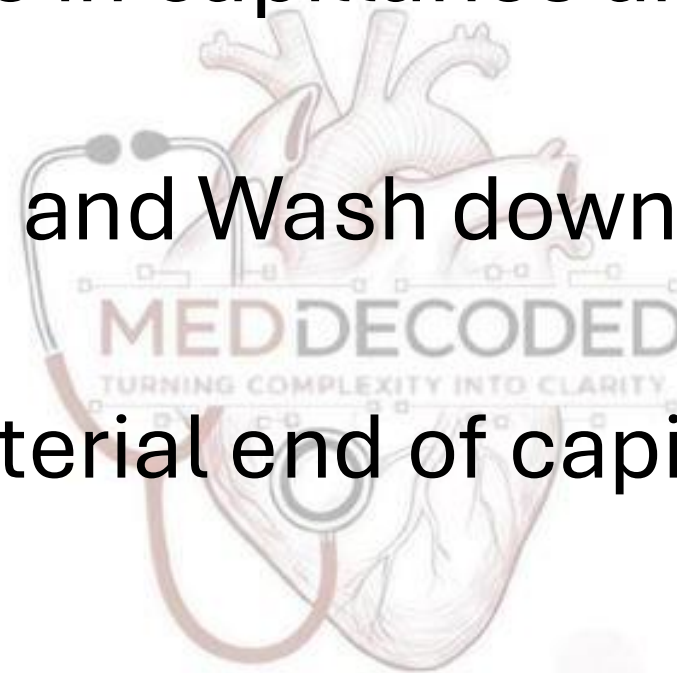
- A. Decrease plasma albumin.
- B. Lymphatic obstruction and increased interstitial hydrostatic pressure.
- C. Arteriolar dilation to increase capillary pressure.
- D. Change from the recumbent to the standing position.
- E. increased capillary hydrostatic pressure.

Answer: B

When lymphatic drainage is blocked (lymphatic obstruction), fluid builds up in the tissue spaces. This accumulation increases the interstitial hydrostatic pressure, which acts as a back-pressure that resists further fluid from leaving the capillaries. Therefore, net fluid loss is decreased.

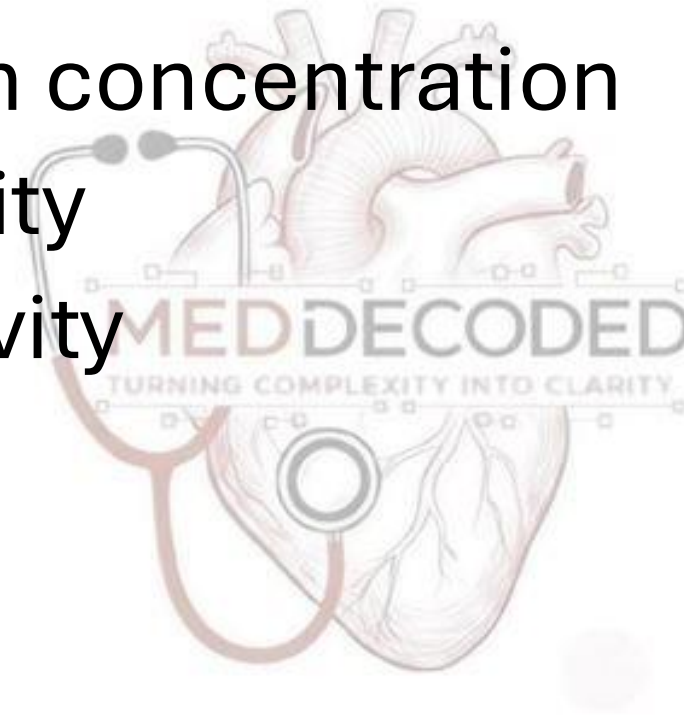
3. Which of the following pairs are NOT related to each other?

- A. Increased capillary permeability and Generation of edema.
- B. Increased colloid pressure in capillaries and Development of edema.
- C. Increased lymph drainage and Wash down of proteins in interstitial fluid.
- D. Hydrostatic pressure in arterial end of capillaries and Filtration.



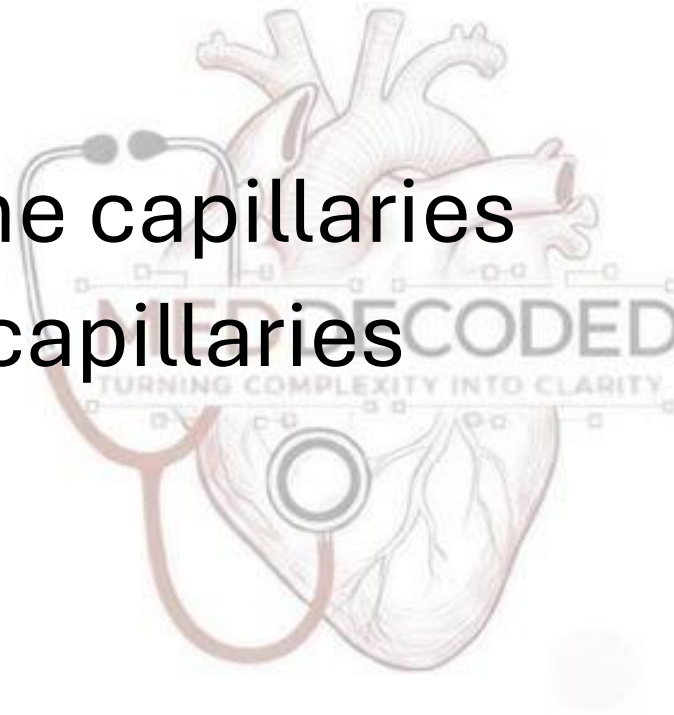
4. Which of the following will cause an increase in the plasma oncotic pressure inside the capillaries?

- A. Decrease in plasma protein concentration
- B. Increase in plasma protein concentration
- C. Increased lymphatic activity
- D. Decreased lymphatic activity



5. In the equation of NFP, what does negative net pressure indicate?

- A. Fluid filtration
- B. Fluid reabsorption
- C. Outflow of proteins from the capillaries
- D. Inflow of proteins into the capillaries



6. Which of the following changes favor(s) the movement of surrounding interstitial fluid into the capillary lumen (i.e., fluid reabsorption into the capillary):

- A. An increase in the colloid osmotic pressure of the interstitial fluid surrounding the capillary
- B. An increase in the hydrostatic blood pressure in the capillary
- C. An increase in the colloid osmotic (oncotic) pressure of plasma
- D. An decrease in the hydrostatic pressure of the interstitial fluid surrounding the capillary
- E. An increase in the capillary permeability

7. Edema at interstitial fluids can be generated by all the followings EXCEPT:

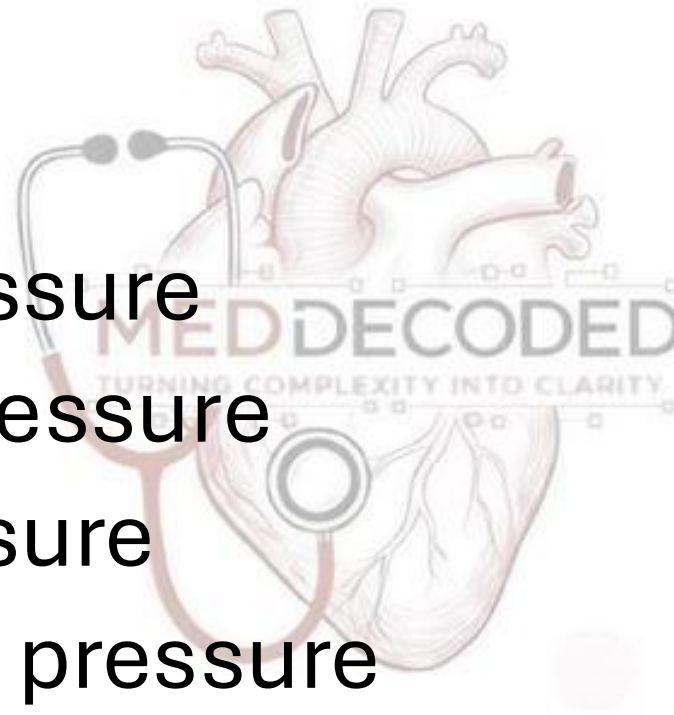
- A. Increased oncotic pressure in interstitial fluids
- B. Increased albumin concentration in plasma
- C. Increased hydrostatic pressure in capillaries
- D. Decreased lymph flow from interstitial fluids
- E. Increased capillary permeability

Answer: B

Increased albumin concentration in plasma raises the plasma colloid osmotic pressure (π_p). Therefore, it prevents or reduces edema rather than causing it.

8. A 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



9. 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

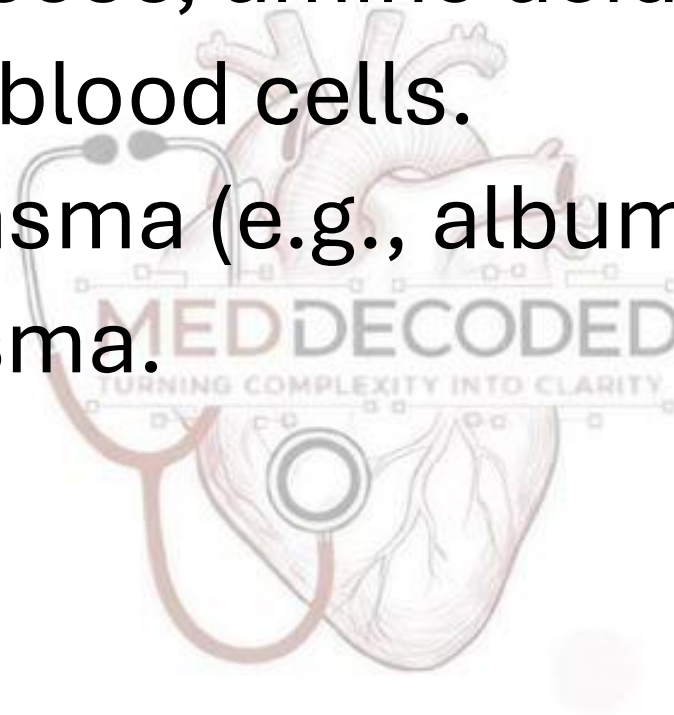
Increased wash down of protein from interstitial fluid is an important safety factor against edema. When lymph flow flushes proteins out of the interstitial space, it lowers the interstitial colloid osmotic pressure (π_i). Lower protein levels in tissues mean less water is pulled out of the capillaries, thereby preventing or reducing edema rather than causing it.

10. 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. Increased capillary hydrostatic pressure

11. 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

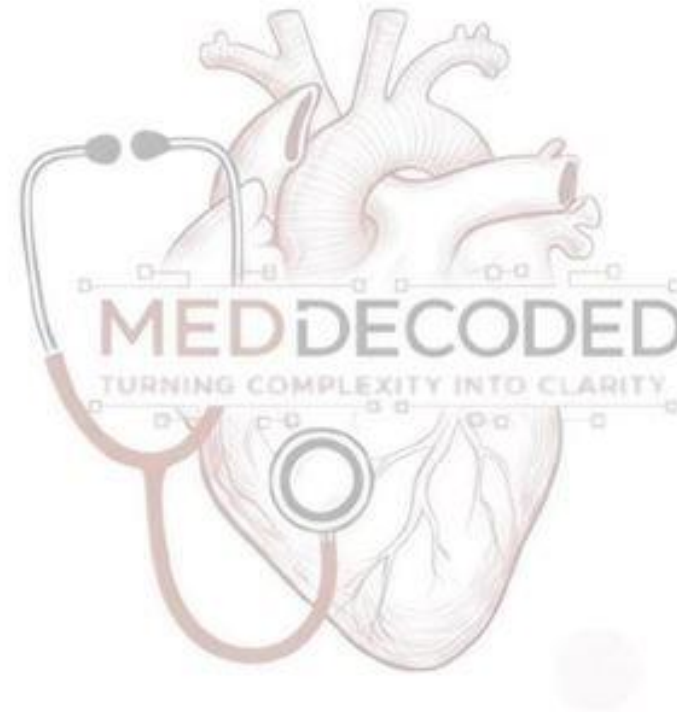


12. Which of the following pairs are NOT related to each other?

- A. High albumin concentration in plasma and Reabsorption.
- 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

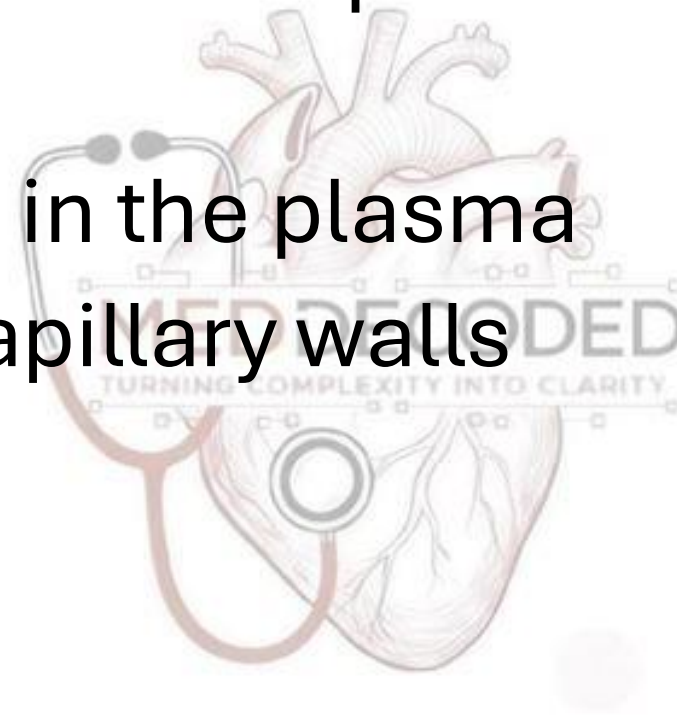
13. The structure that is considered the blood reservoir:

- A. Systemic capillaries
- B. Systemic arteries
- C. Systemic veins
- D. Pulmonary vessels
- E. The heart atria



Q14: All of the following are causes of edema EXCEPT:

- A. High filtration
- B. High hydrostatic pressure in the capillaries
- C. High lymphatic activity
- D. Low protein concentration in the plasma
- E. High permeability of the capillary walls



15. The pressure of capillaries does not change unless the force on the walls changes because:

- A. The arterial end has higher pressure than the venous end
- B. The high protein concentration in the plasma
- C. Sympathetic activity on the AV node
- D. Pulsatility of the capillary flow
- E. The absence of smooth muscles in the capillary walls

Answer: E

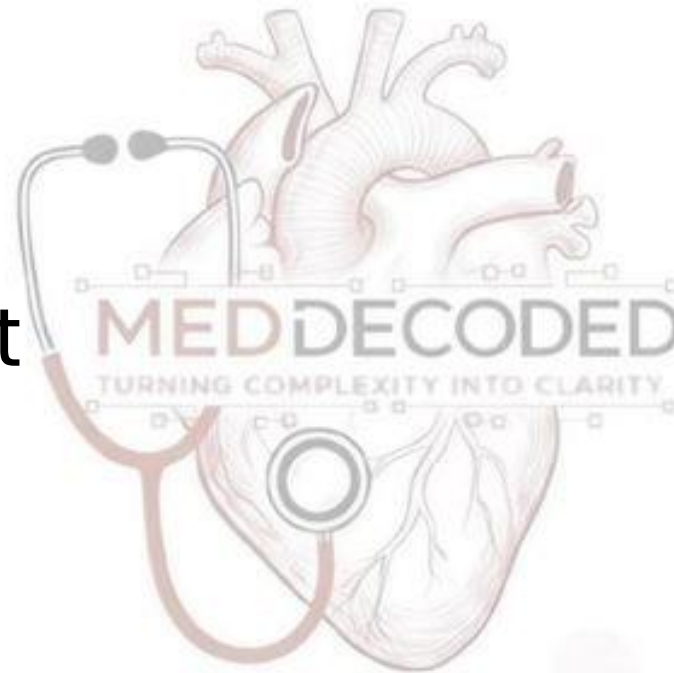
The pressure (hydrostatic pressure) = F/A (The Force from the blood on the walls)/ (Area, which is constant for capillaries because they lack smooth muscles (no constriction or dilation))

16. Regarding the pulsatile flow of the systemic cycle, which of the following is TRUE?

- A. It depends on the precapillary sphincter activity
- B. It ranges from a minimum of 0% to a maximum of 100%
- C. The systolic phase is longer than the diastolic phase
- D. It goes from the right ventricle to the left atrium
- E. It carries most of the blood in the human body

17. What would happen if the pressure gradient across the capillary collapses (P at venous = P at arterial)?

- A. Flow is halved
- B. Flow stops
- C. No effect
- D. Positive dromotropic effect
- E. None of the above

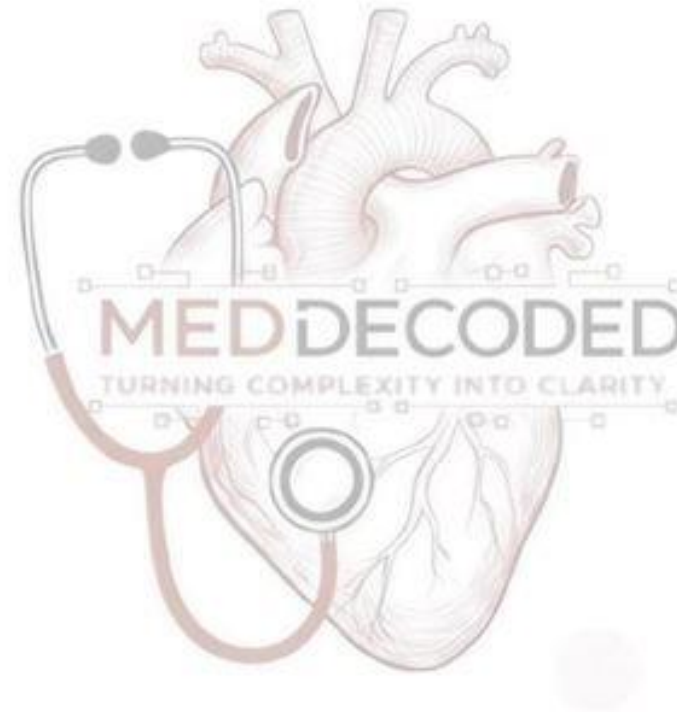


Answer: B

The pressure (hydrostatic pressure) = F/A (The Force from the blood on the walls, which depends on volume). If the change in pressure is 0, it means that F is constant (A is always constant in capillaries), so the volume is constant (No net filtration).

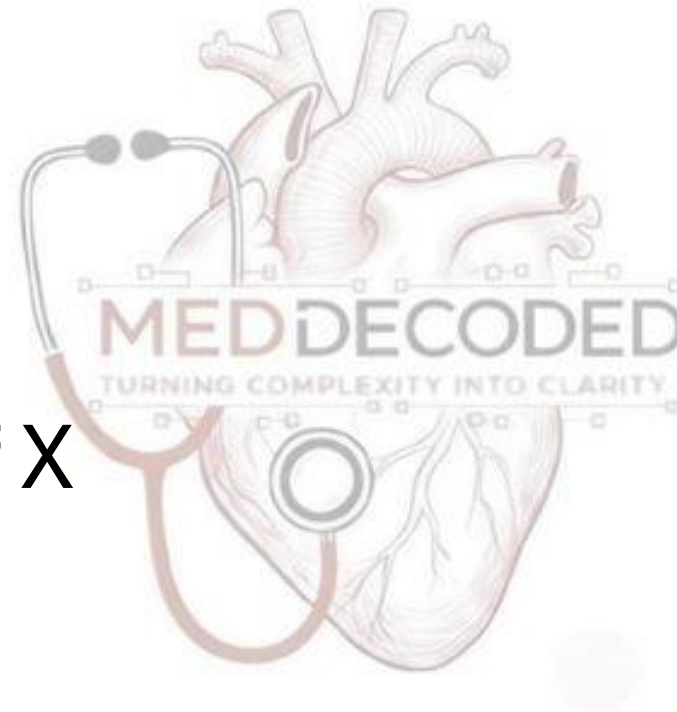
18. If the radius of a capillary is reduced to half its original value, the required driving force to maintain the same flow is (times relative to the original):

- A. $1/16$
- B. 16
- C. $1/4$
- D. 4
- E. Same DF as before



19. If Pv increases by X mmHg and Pa decreases by X mmHg, what would happen to Pc?

- A. Increases by 2/3 of X
- B. Decreases by 1/5 of X
- C. No change
- D. Increases by 5/6 of X
- E. It depends on the value of X



Explanation:

$$P_c = 1/6 P_a + 5/6 P_v$$

$$P_c^* = 1/6 (P_a - X) + 5/6 (P_v + X)$$

$$P_c^* = 1/6 P_a + 5/6 P_v - 1/6 X + 5/6 X$$

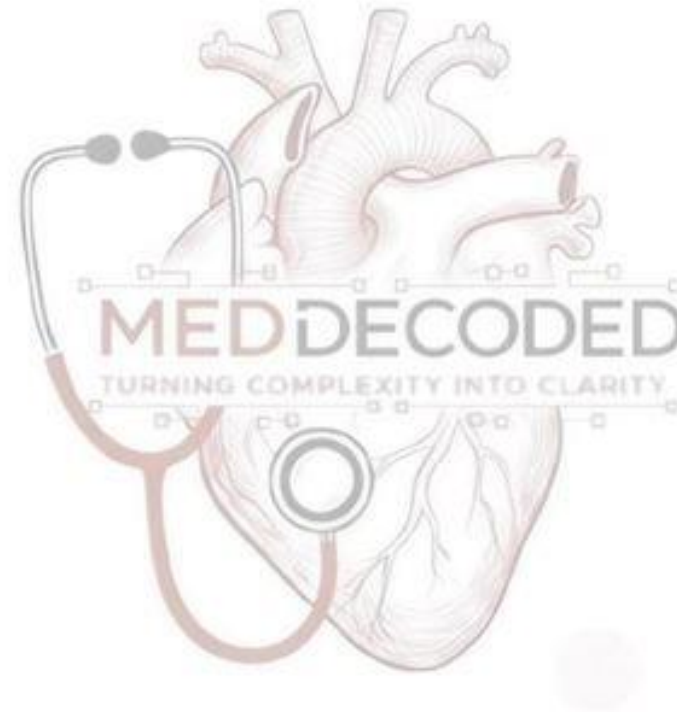
$$P_c^* = P_c + 4/6 X$$

$$P_c^* = P_c + 2/3 X$$

Answer: A

20. Which of the following has the highest P_c ?

- A. Lungs
- B. Skeletal muscles
- C. Smooth muscles
- D. Glomerular capillaries
- E. All have the same P_c

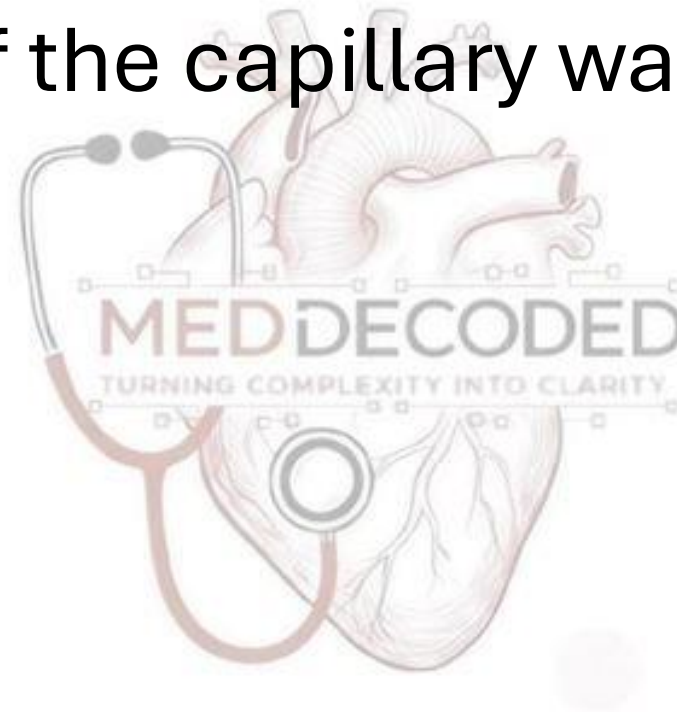


Answer: D

21. In the case of a bee sting, what is the correct order?

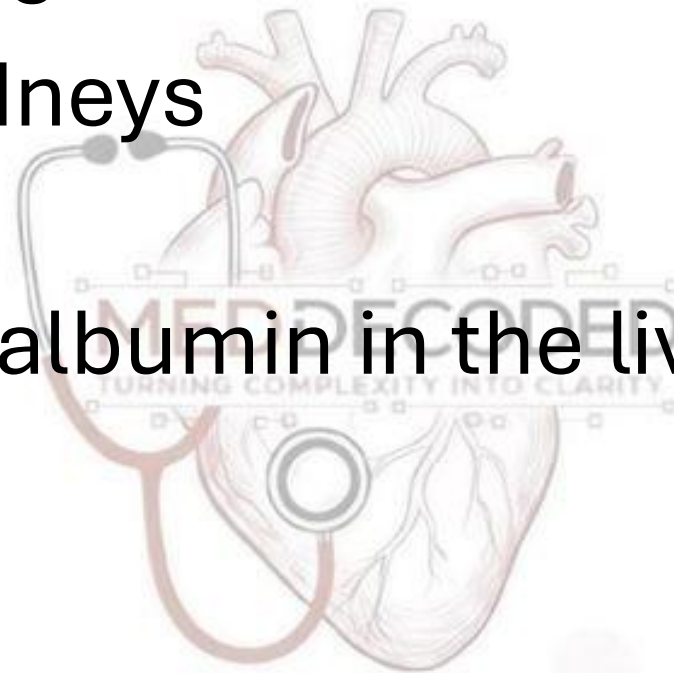
1. Edema forms
2. High filtration
3. Release of histamine
4. Increased permeability of the capillary walls

- A. 1, 3, 4, 2
- B. 3, 4, 1, 2
- C. 4, 3, 2, 1
- D. 3, 4, 2, 1
- E. 1, 2, 4, 3



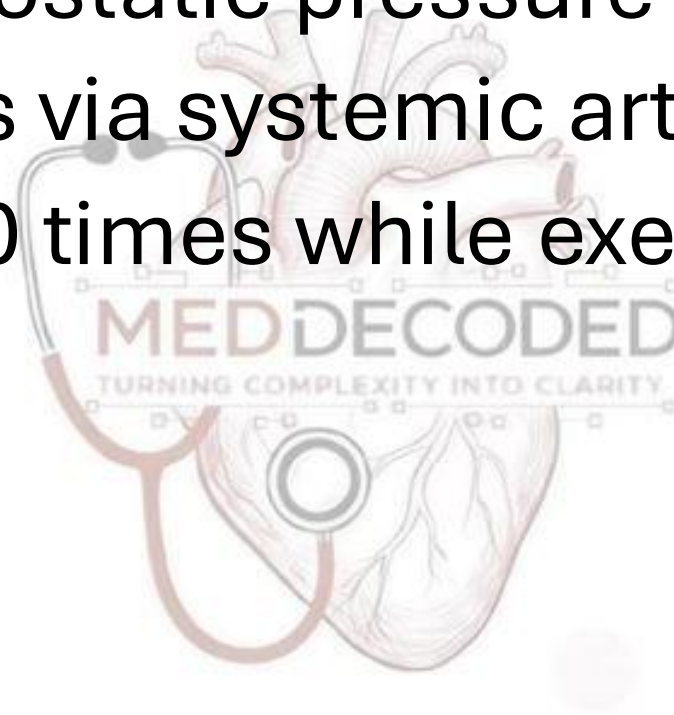
22. All of the following are causes of edema EXCEPT:

- A. Malnutrition
- B. Malabsorption in intestines
- C. High loss of proteins in kidneys
- D. Hyperalbuminemia
- E. Insufficient production of albumin in the liver



23. Which of the following is FALSE regarding lymphatics?

- A. Help reduce edema
- B. Introduce a negative hydrostatic pressure in the ISF
- C. Return fluids and proteins via systemic arteries
- D. Activity increases 20 to 30 times while exercising
- E. All of the above are true

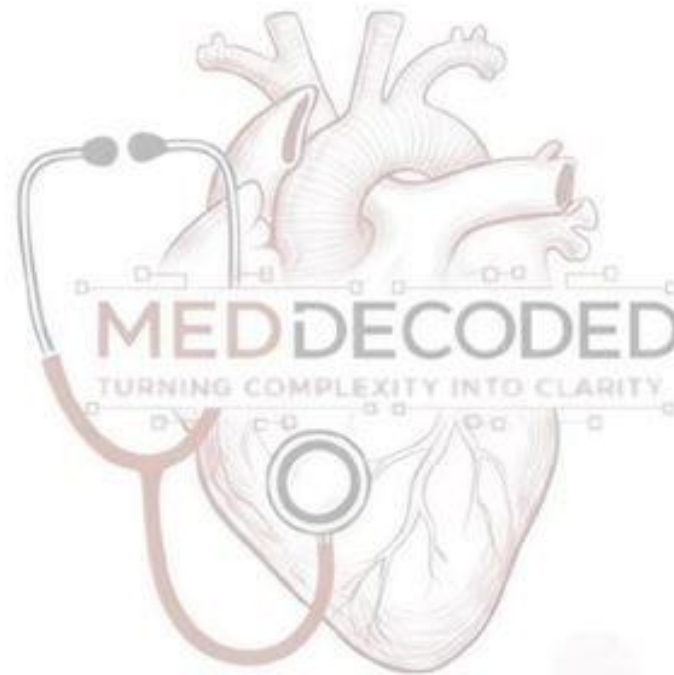


To understand why: A) True , draining excess interstitial fluid prevents edema
B) True , Draining excess interstitial fluid decreases the pressure of it on the capillary walls from outside $[P_i]$ that it becomes negative and starts sucking fluid from the capillary
C) Is false , because it returns them via systemic veins not arteries
D) True , exercise means more filtration thus, more lymphatic activity

Answer: C

24. What percentage of the filtered fluids is usually reabsorbed into the capillaries?

- A. 100 %
- B. 85 %
- C. 50 %
- D. 15 %
- E. 0 %

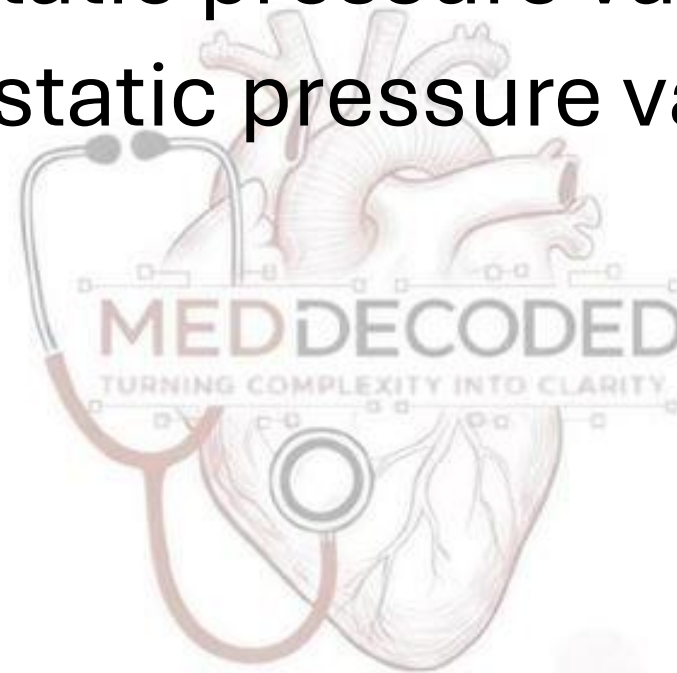


Filtered = 20 L , Reabsorbed = 17 L (you should memorize them)
 $17/20 * 100\% = 85 \%$

Answer: B

25. Something special to encapsulated organs is:

- A. Positive P_c values
- B. Positive interstitial hydrostatic pressure values
- C. Negative interstitial hydrostatic pressure values
- D. A + B
- E. A + C

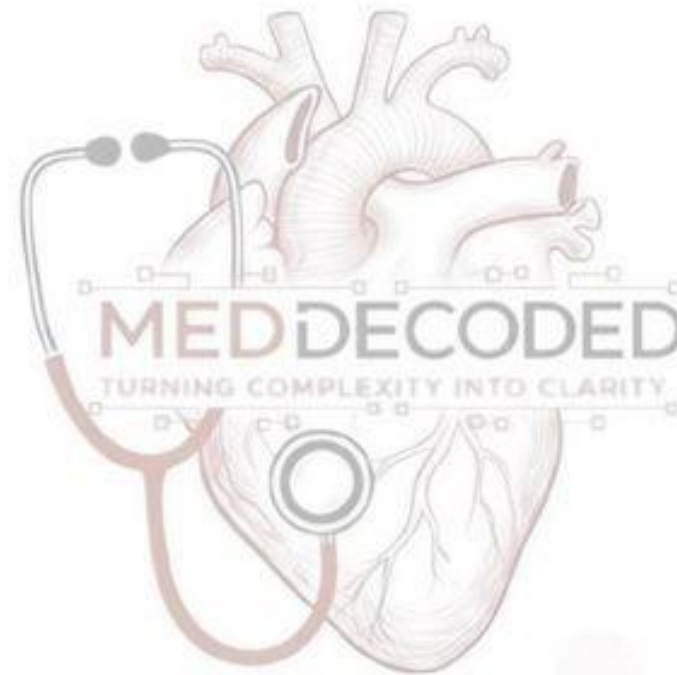


Explanation: A) is correct but it's not "special" for encapsulated organs
B) True as mentioned in Bowman's capsule in the kidney (+ve P_i , favouring reabsorption)
C) False
D&E) As mentioned (A) is not "special" so this is not the answer

Answer: B

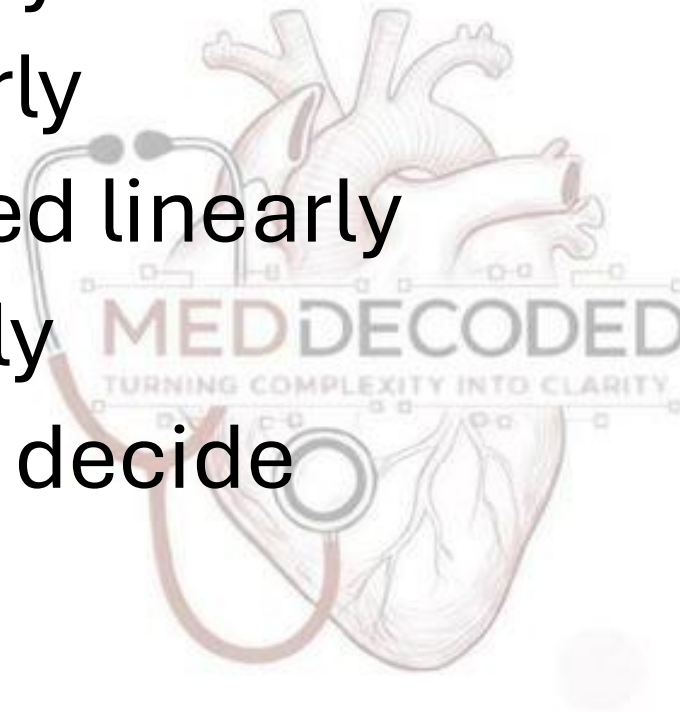
26. Which of the following forces (pressures) has changing values across the capillary?

- A. P_c
- B. P_{if}
- C. Π_c
- D. Π_{if}
- E. All except P_c



27. If we assumed that the relation between albumin concentration and Π is linear, the real value for Π is:

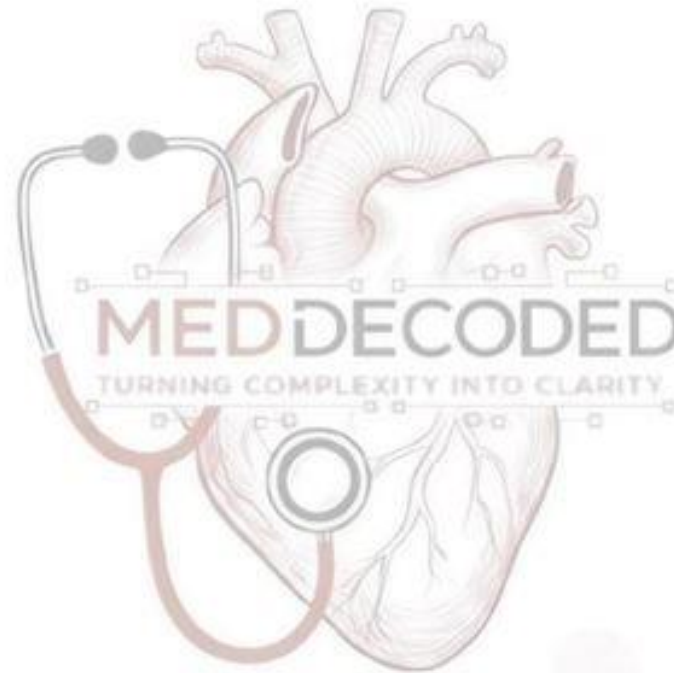
- A. Less than expected linearly
- B. More than expected linearly
- C. Equal to the value expected linearly
- D. Twice the expected linearly
- E. No enough information to decide



Answer: E; because Π behaves linearly below the critical conc. and nonlinearly after that.

28. If we have 1 mmol/L of NaCl, what is the expected osmotic pressure approximately (in mmHg)?

- A. 0
- B. 10
- C. 20
- D. 30
- E. 40

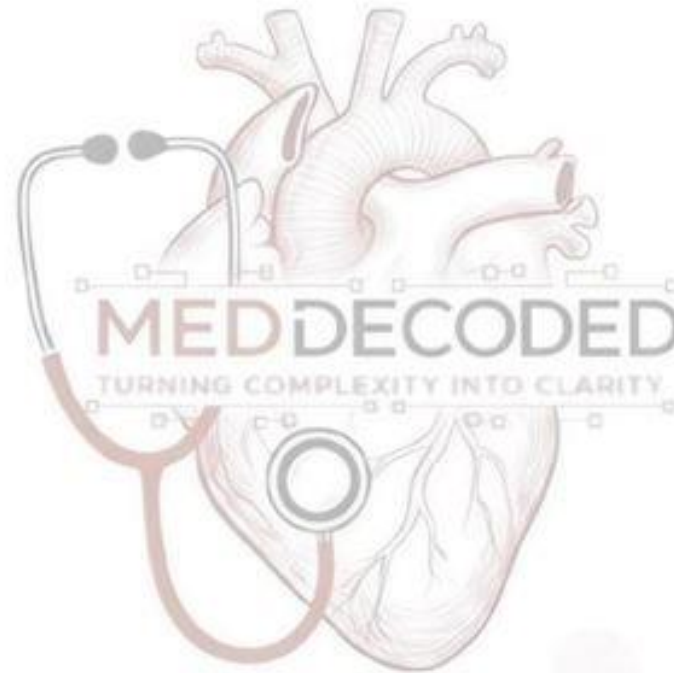


Answer: E

NaCl dissociates completely in water into two particles: Na^+ and Cl^- , Osmolarity = $1 \text{ mmol/L} \times 2 = 2 \text{ mOsm/L}$ and each 1 mOsm/L exerts an osmotic pressure of 19.3 so exact calculations will give $19.3 \times 2 = 38.6 \text{ mmHg} \rightarrow 40 \text{ mmHg}$

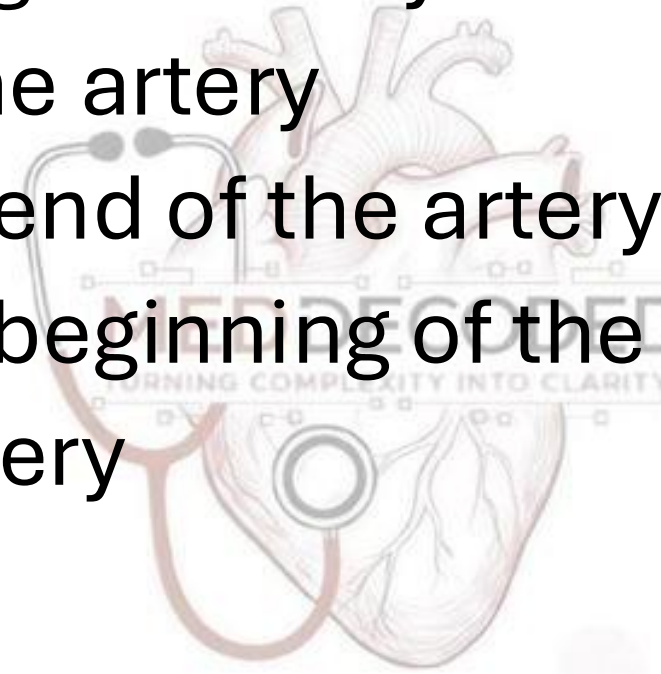
29. The most important capillary exchange mechanism for solute exchange is:

- A. Diffusion
- B. Transcytosis
- C. Bulk flow
- D. B + C
- E. None of the above



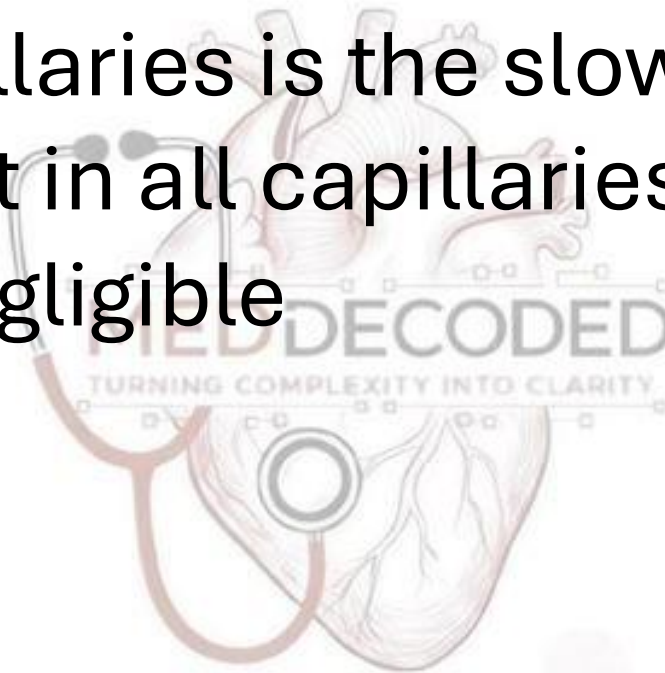
30. Which of the following will increase blood flow through an artery?

- A. Increased resistance along the artery
- B. Decrease in diameter of the artery
- C. Increased pressure at the end of the artery
- D. Increased pressure at the beginning of the artery
- E. Increased length of the artery



31. In skeletal muscle, why is the osmotic pressure at the arteriolar end similar to the osmotic pressure at the venous end?

- A) The velocity in these capillaries is the slowest
- B) The pressure is the lowest in all capillaries
- C) The filtrated plasma is negligible

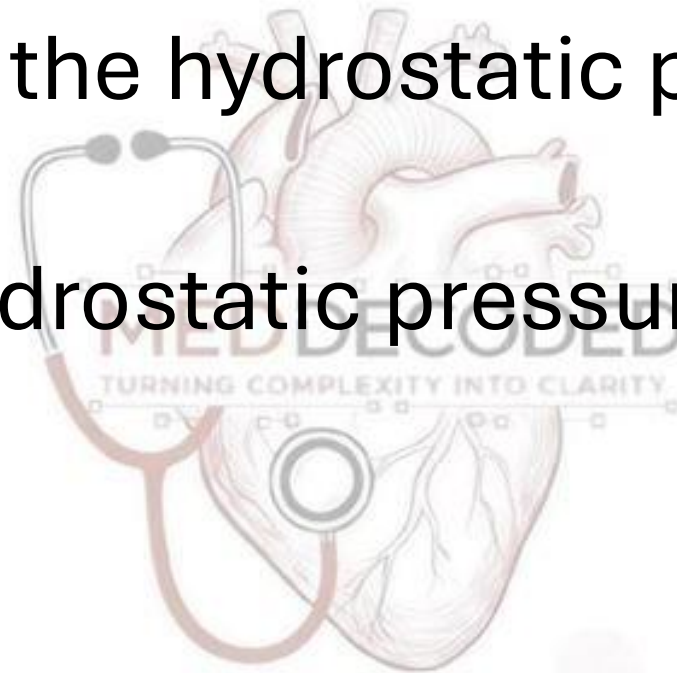


32. 2 mg of albumin has a greater effect than 2 mg of globulin because:

- A. There are more albumin molecules in that same weight
- B. Globulin has a lower molecular weight, which reduces its osmotic activity per molecule
- C. Albumin is a highly non-polar protein, allowing it to cross the capillary membrane freely
- D. Osmotic pressure depends strictly on the total mass of the solute rather than the concentration of individual particles

33. Regarding capillaries, which statement is incorrect?

- A) All capillaries exhibit filtration at the arteriolar end and reabsorption at the venous end
- B) In glomerular capillaries, the hydrostatic pressure is the highest
- C) In lung capillaries, the hydrostatic pressure is low



34. In the case of constriction of pelvic veins, which of the following changes would occur to the microcirculatory bed (starling forces)?

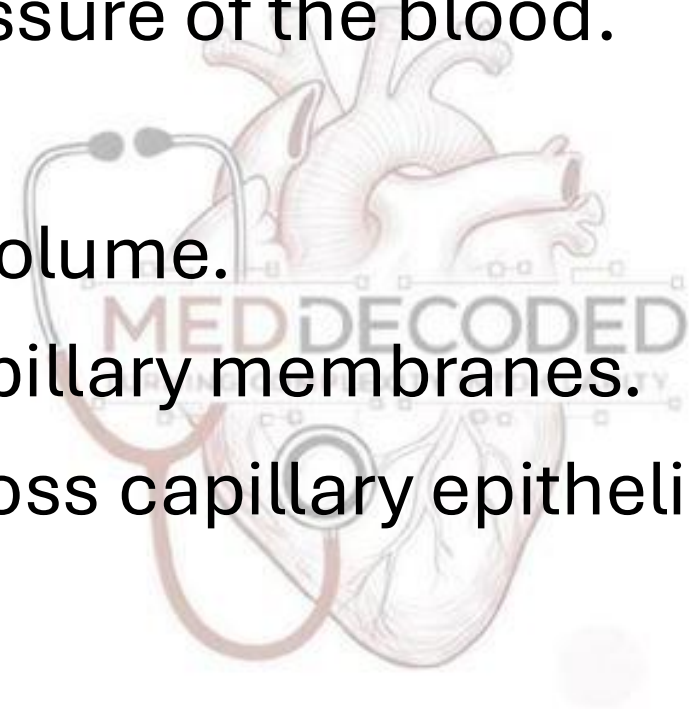
	Interstitial hydrostatic pressure	Mean capillary hydrostatic pressure	Lymph flow
A	↑	↑	↑
B	↑	↑	↓
C	↑	↓	↑
D	↓	↓	↓
E	↓	↓	↑

35. In a patient with liver cirrhosis who complains of edema in the lower extremities, which of the following might be decreased and contribute to the edema?

- A. Decrease in plasma colloid osmotic pressure / decrease in protein concentration in plasma
- B. Decrease in capillary hydrostatic pressure due to systemic venous pooling
- C. Decrease in interstitial fluid hydrostatic pressure caused by lymphatic obstruction

36. Reduction of plasma proteins to half its normal concentration is expected to cause:

- A. increase colloid osmotic pressure of the blood.
- B. increase body weight.
- C. decrease in interstitial fluid volume.
- D. decrease filtration across capillary membranes.
- E. has no effect on filtration across capillary epithelium.

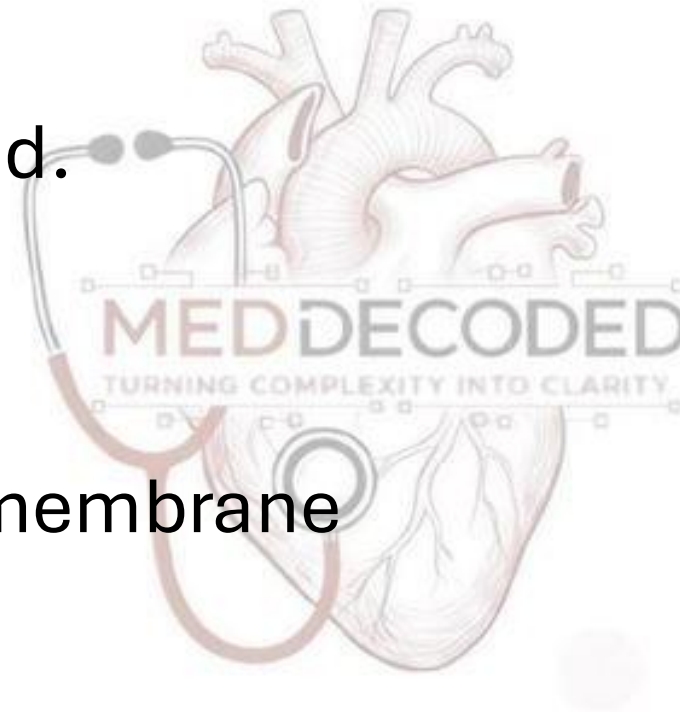


Answer: B

Exp! Increase in interstitial fluid volume causes an increase in body weight

37. Albumin is more important than globulin in generating blood colloid osmotic pressure because:

- A. it has less negative charges.
- B. it is less concentrated in blood.
- C. it has less molecular weight.
- D. its produced by the liver.
- E. it cannot cross the capillary membrane

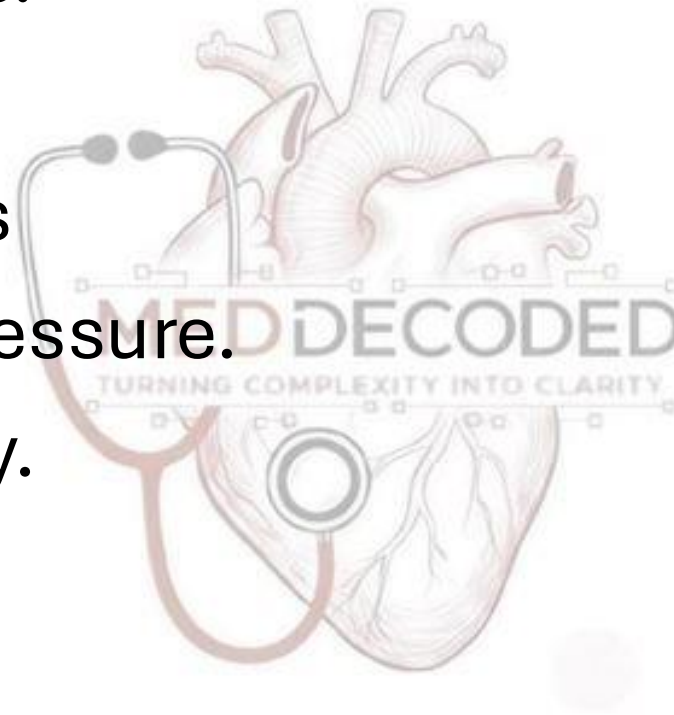


Answer:C

Exp! Albumin has Lower molecular weight → more particles for a given mass

38. An increase in all the following would tend to increase the filtration rate across a capillary wall EXCEPT?

- A. capillary hydrostatic pressure.
- B. capillary permeability.
- C. diameter of the draining veins
- D. Interstitial colloid osmotic pressure.
- E. dilatation of the feeding artery.



Answer: C

Exp! Venous dilation tends to reduce filtration (favor reabsorption) while arteriolar dilation increases capillary filtration.

39. Na^+ has no osmotic effect across capillary wall because:

- A. Na^+ atomic mass is so small.
- B. Na^+ crosses the capillary wall freely.
- C. Na^+ is cation, only anions show osmotic pressure
- D. plasma concentration of sodium [Na^+] ranges from 135-145 mEq/l.
- E. Na^+ is attracted to Cl^-

Answer: B
Exp! Capillaries are highly permeable to water + small solutes, including ions

40. Regarding Starling forces across capillaries, one of the following is true

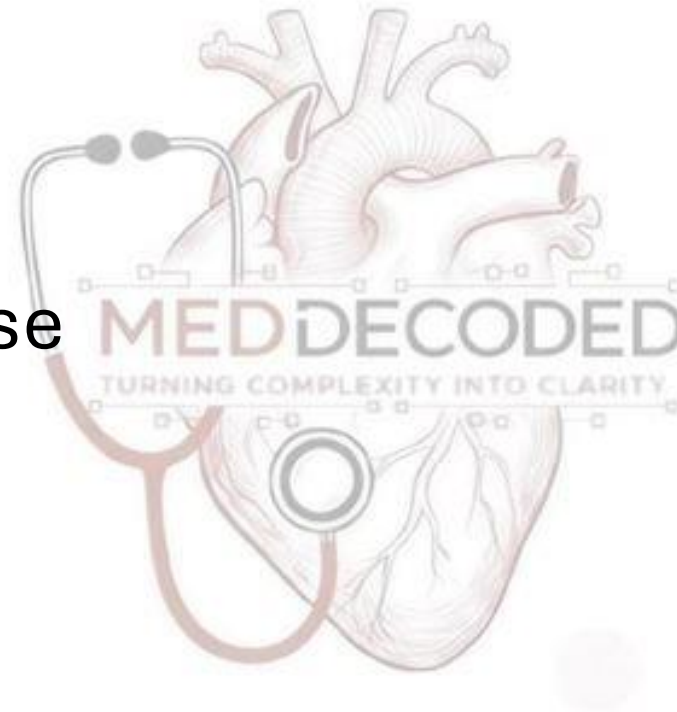
- A. all capillaries in our body show filtration at their arterial end and reabsorption at their venous end.
- B. pulmonary capillary hydrostatic pressure is more than that observed in glomerular capillaries.
- C. capillary hydrostatic pressure is the same among different capillaries in our body.
- D. glomerular capillaries show only filtration across their entire length.
- E. filtration and reabsorption are equal across any capillary.

Answer: D

Exp! Kidney (glomerular capillaries): only filtration occurs
G.I. capillaries: mainly absorption (uptake of fluid/nutrients into blood)

41. Regarding hypoalbuminemia all the following are expected EXCEPT:

- A. generalized edema
- B. pitting edema
- C. weight gain
- D. liver cirrhosis can be the cause
- E. lymphatic flow decreases.



Answer: E

Exp! Albumin is made in the liver, so option D is correct, Pitting edema can result from decreased plasma protein concentration (e.g., reduced albumin synthesis in liver cirrhosis or malnutrition), whereas non-pitting edema is usually caused by failure of lymphatic drainage which is not the case here

42. Regarding lymphatic system, all the following are true EXCEPT

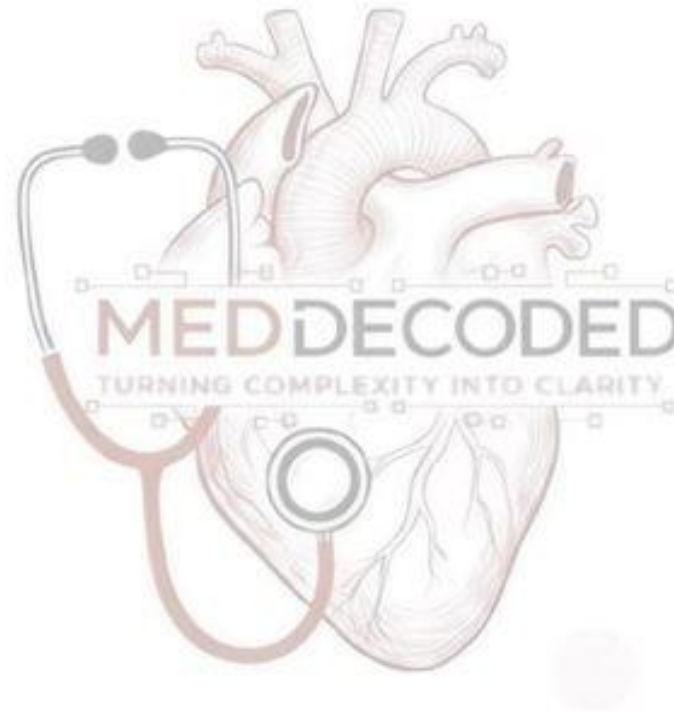
- A. Lymph is not blood (does not contain RBCs).
- B. Lymphatic edema is nonpitting edema.
- C. the lymphatic system empty their content into systemic veins.
- D. lymphatic edema is localized edema
- E. the rate of lymph flow from a tissue is equal to the rate of movement of fluid out of its capillaries

Answer: E

Exp! Not all fluid filtered is taken away by lymph, a large portion is actually returned to the capillaries directly, and yes lymphatic edema is localized because lymph flow would be blocked in a certain area only

43. In a skeletal muscle capillary, the capillary hydrostatic pressure is 32 mm Hg, the capillary oncotic pressure is 27 mm Hg, and the interstitial hydrostatic pressure is 2 mm Hg. Interstitial oncotic pressure is zero mmHg. What is the driving force across the capillary wall and will it favor filtration or absorption?

- A. 3 mm Hg, favoring absorption
- B. 3 mm Hg, favoring filtration
- C. 7 mm Hg, favoring absorption
- D. 7 mm Hg, favoring filtration
- E. 9 mm Hg, favoring filtration



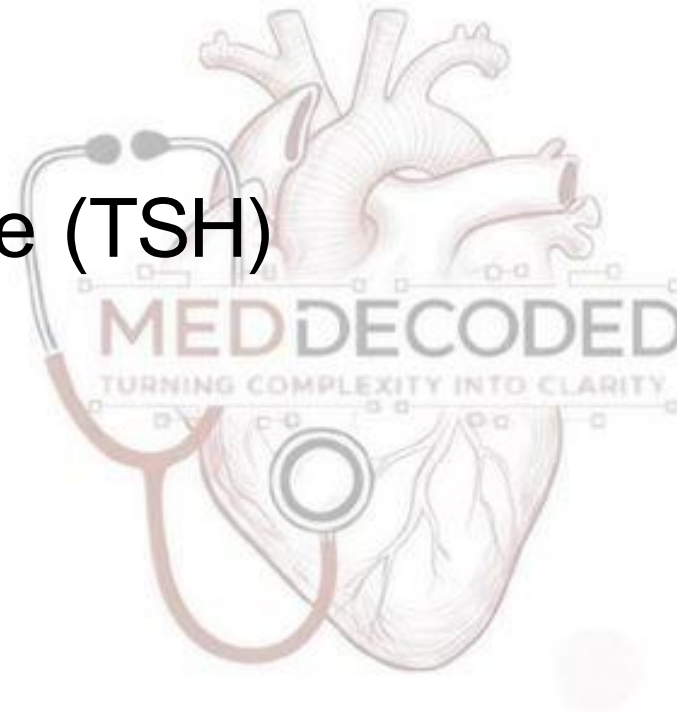
Answer: B
Exp! 32 out, 27 in, 2 in vessel

Signal transduction

(43) Questions

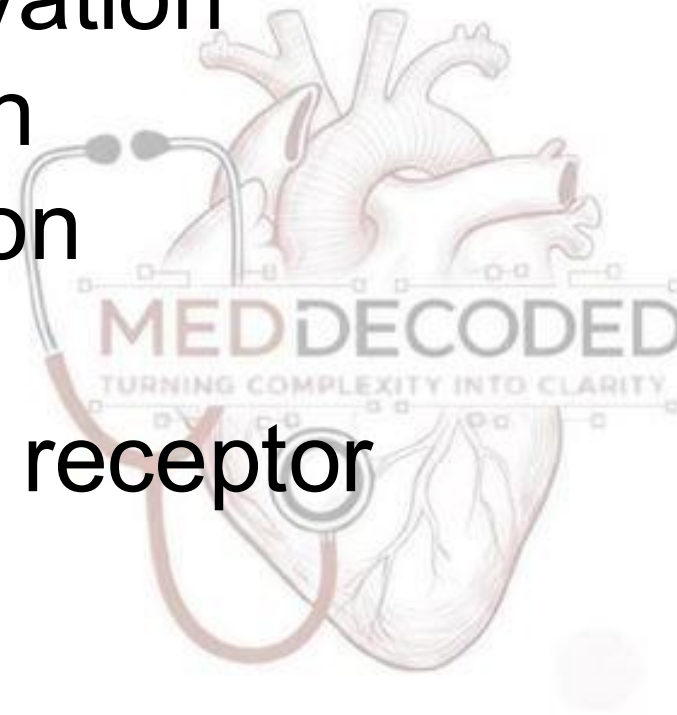
1. Which of the following hormones has intracellular receptors ?

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



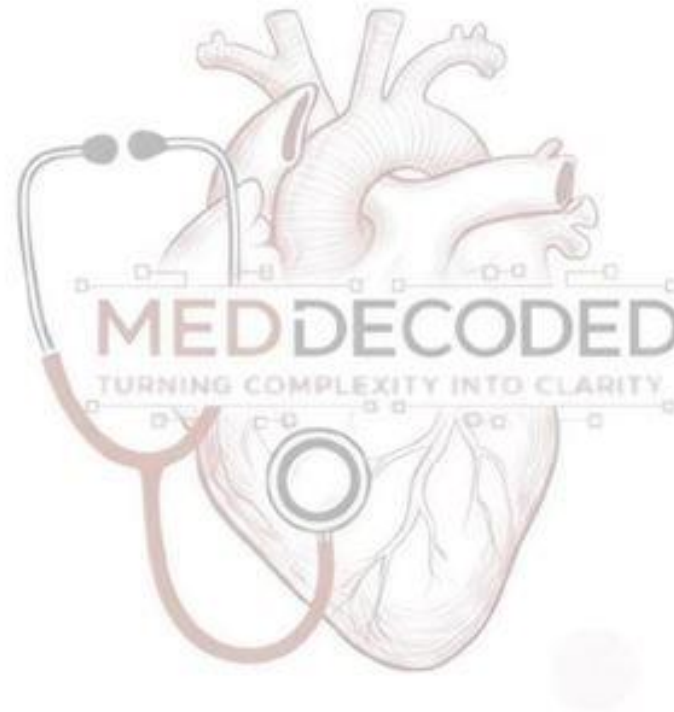
2. All of the following turn off G Protein Coupled Receptor GPCR signal EXCEPT :

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



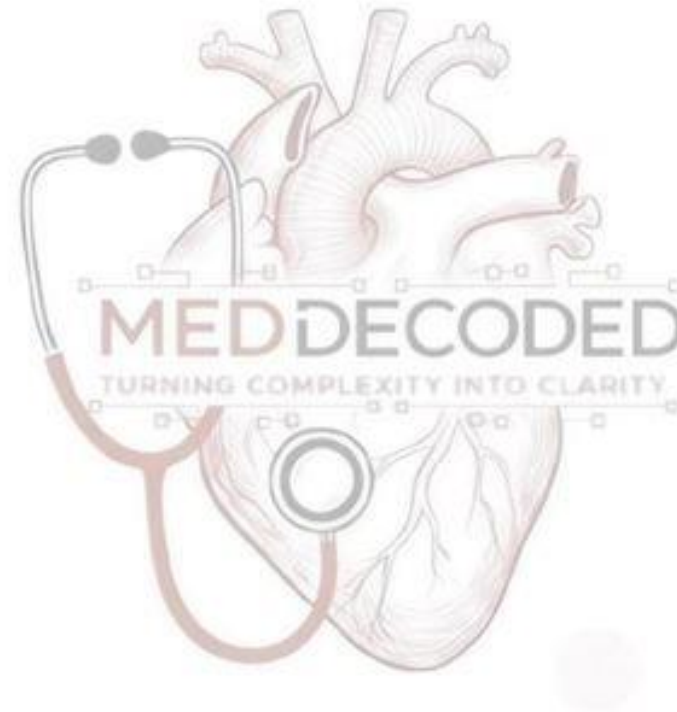
3. The protein (ligand) associated with leptin receptor:

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



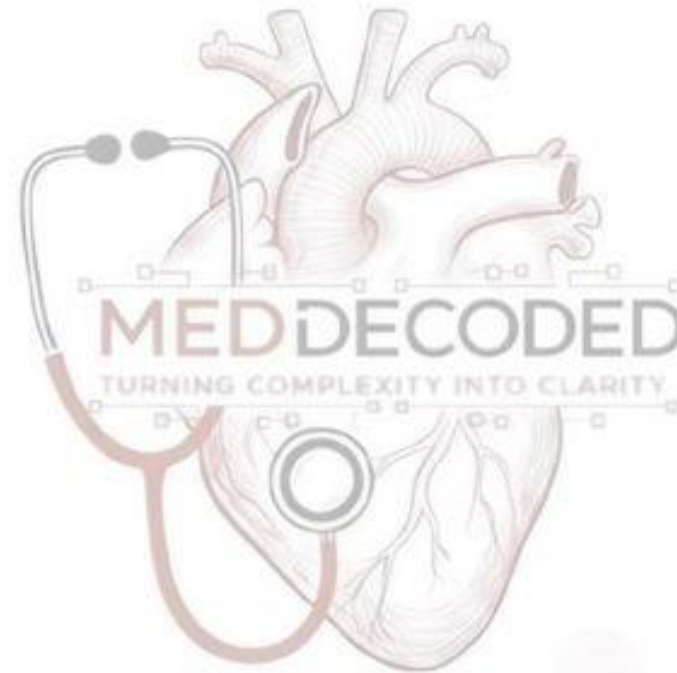
4. Some cells secrete chemicals into the extracellular fluid that act on neighboring cells in the same tissue . Which of the following refers to this type of regulation?

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



5. Which of the following hormones activated enzyme-linked receptors ?

- A)ADH
- B)insulin
- C)ACTH
- D)PTH
- E)aldosterone

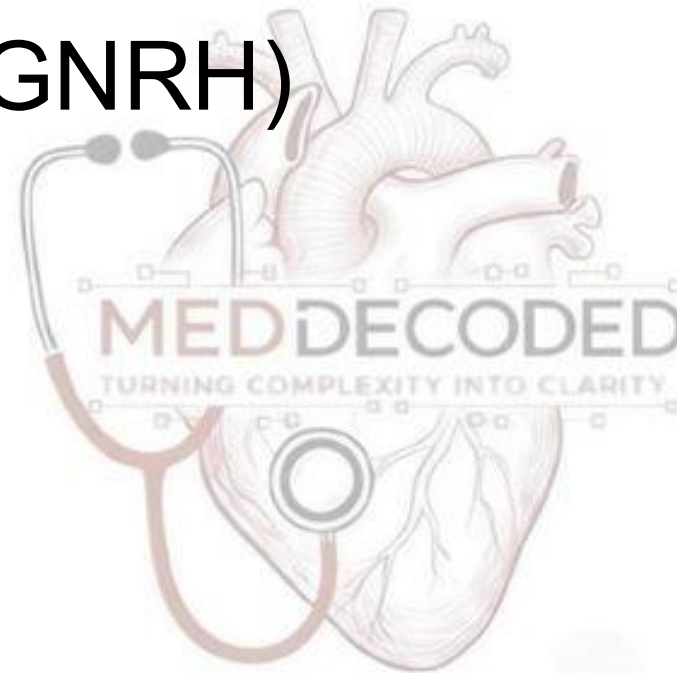


6. Which change would be expected to occur with increased binding of a hormone to plasma proteins?

- 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

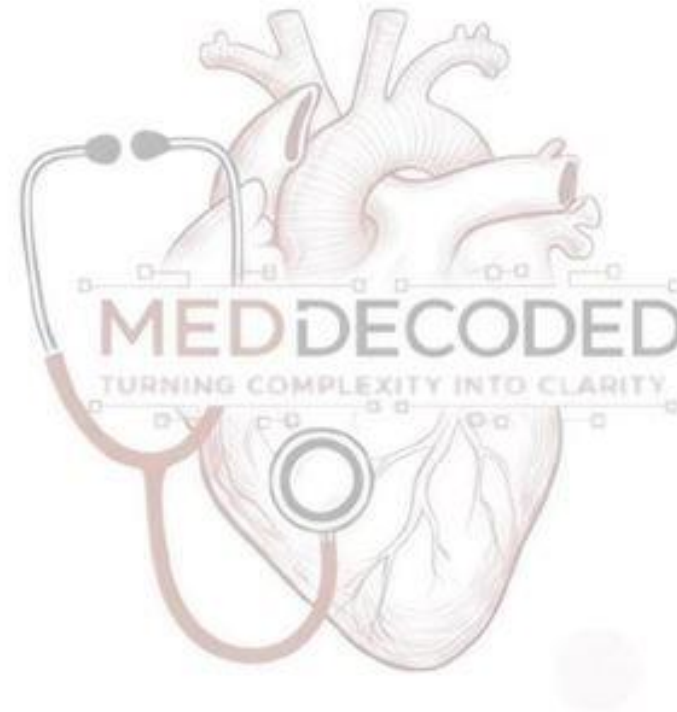
7. Which of the following hormones is both synthesized and stored in the pituitary gland?

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



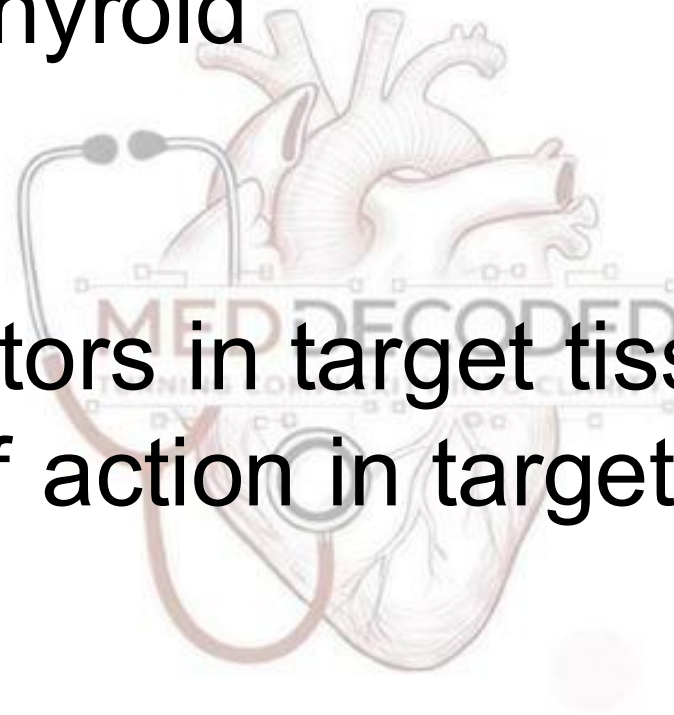
8. The type of membrane protein enables cells to respond to specific hydrophilic ligand by changes in the level of intracellular c-AMP?

- A)ligand
- B)cholesterol
- C)phospholipid.
- D)enzymes.
- E)receptors.



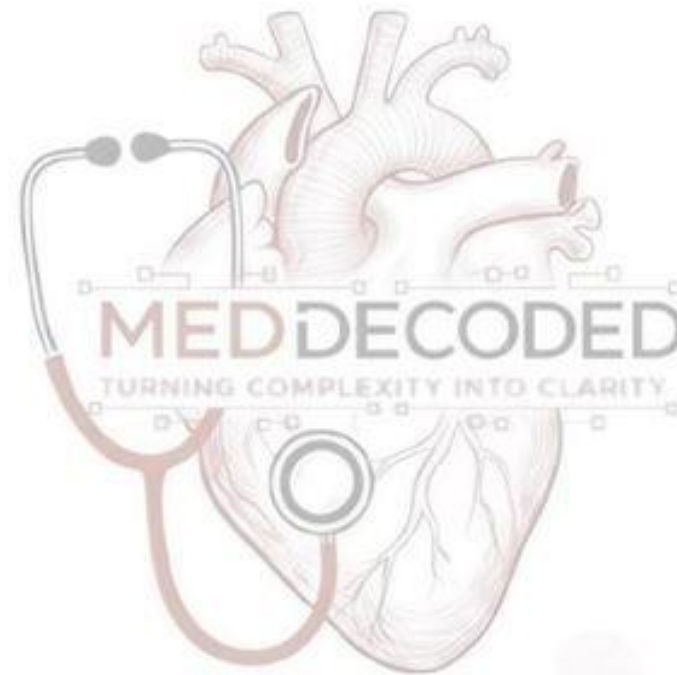
9. Which of the following physiological responses is greater for triiodothyronine (T3) than for thyroxine (T4) ?

- 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



10. hormone that uses cGMP signaling pathway:

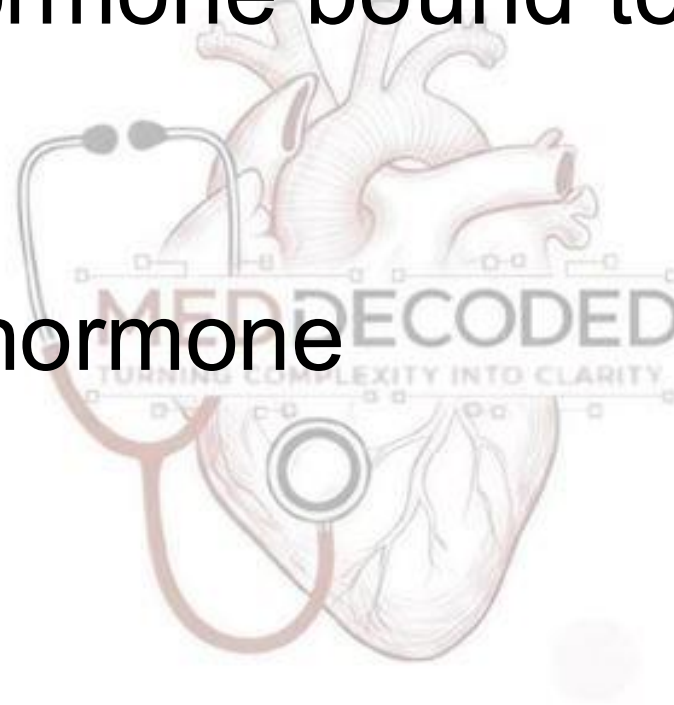
- A) GnRH
- B) ANP
- C) GH
- D) Prolactin
- E) Aldosterone



Answer: B

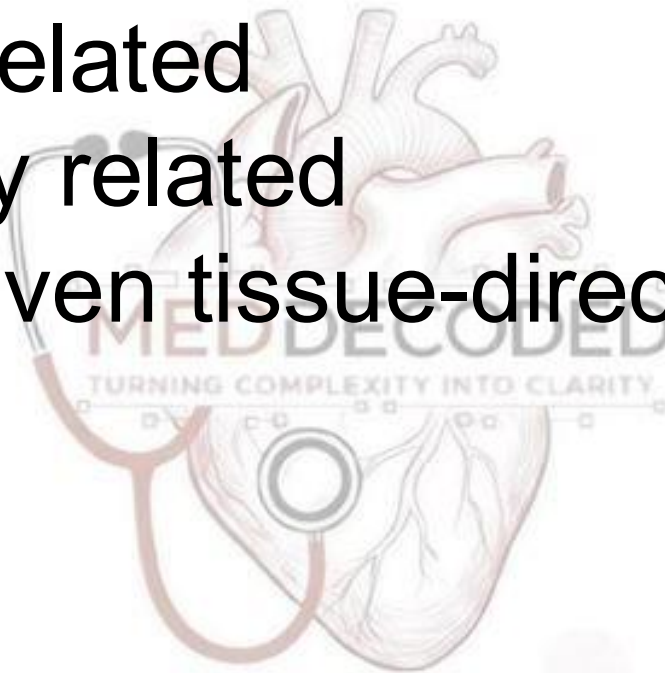
11. Clearance of a hormone is high if:

- 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



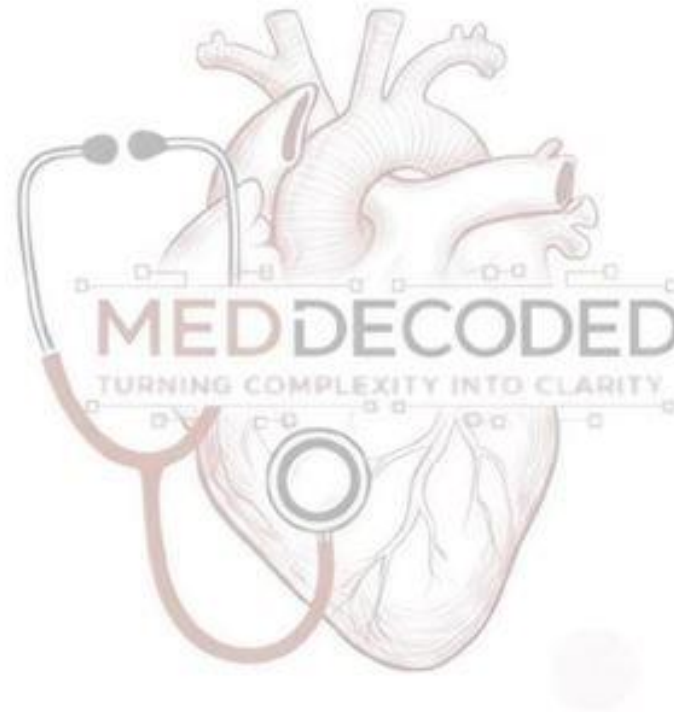
12. Receptor affinity to a ligand is judged by:

- 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



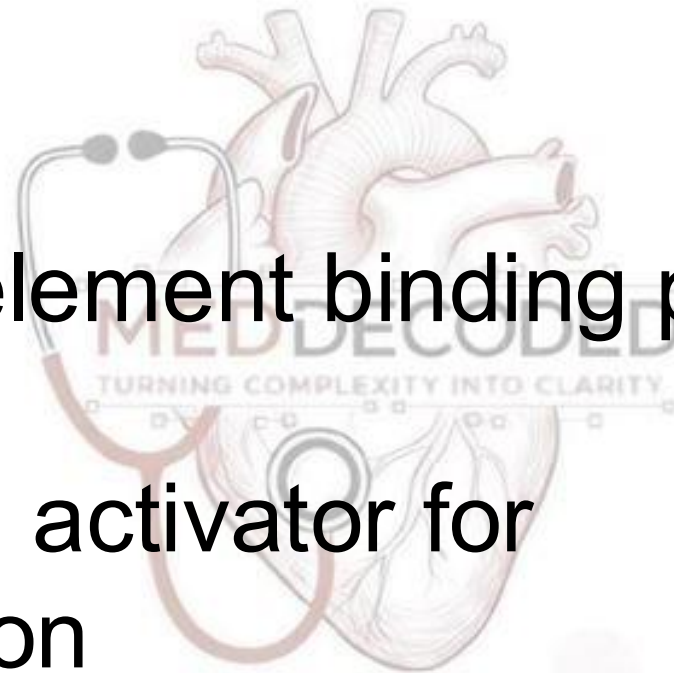
13. Which of the following hormones has nuclear receptors that are typically associated with retinoic acid receptors (RXR)?

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



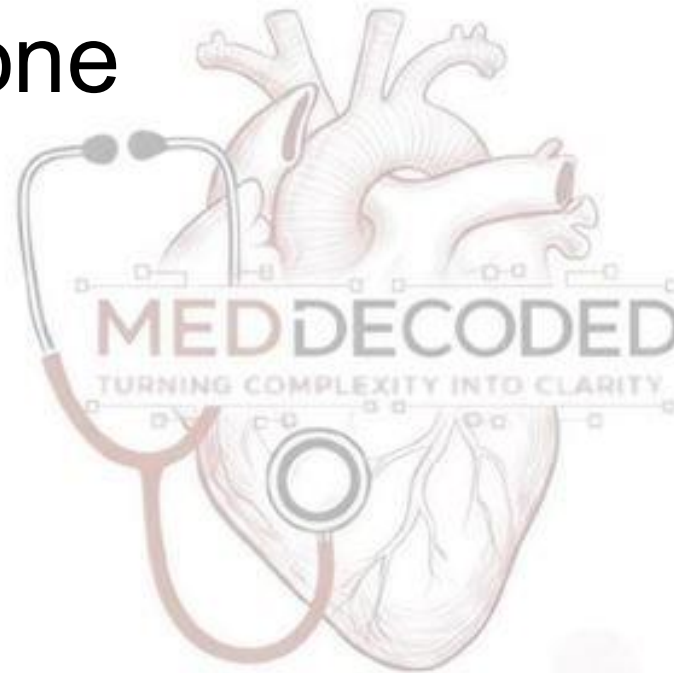
14. When a G protein coupled receptor is activated, any of the following may occur EXCEPT:

- 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



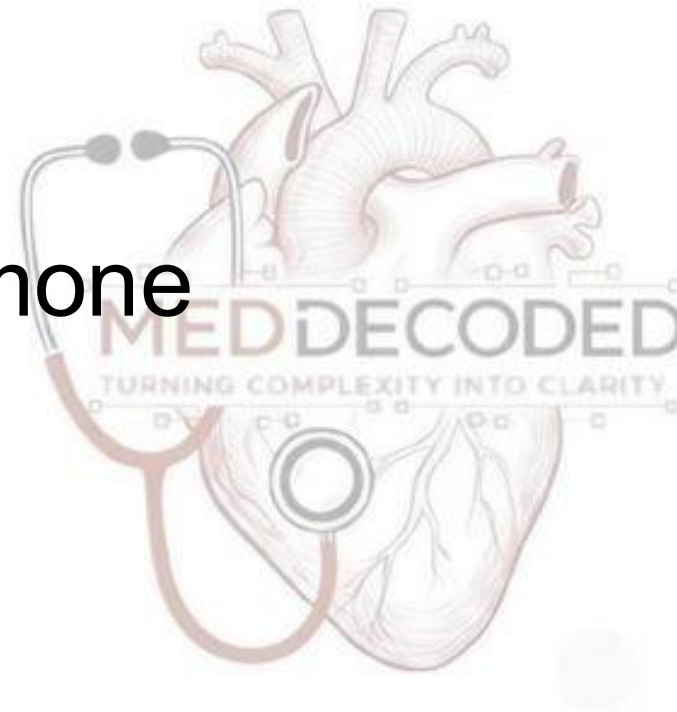
15. Which of the following hormones has intracellular receptors:

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



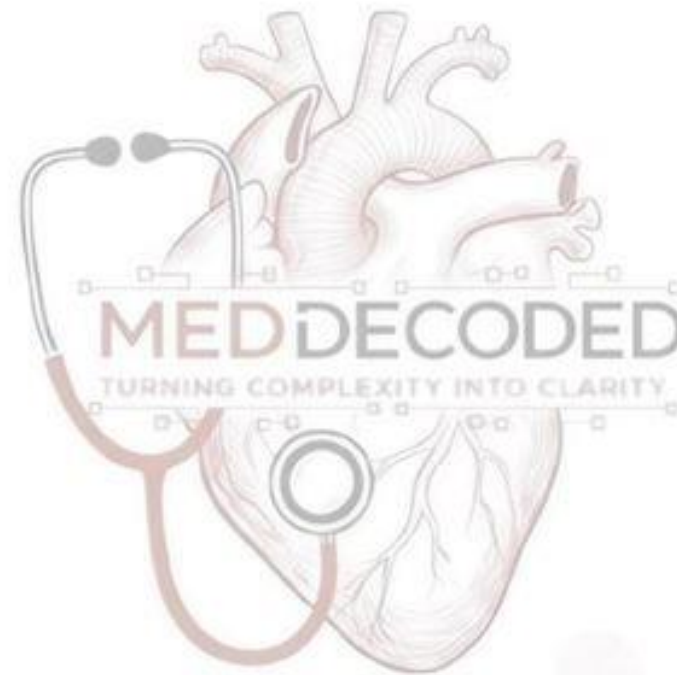
16. All of the following are derivatives of Tyrosine EXCEPT:

- A) Epinephrine
- B) Dopamine
- C) Thyroxine
- D) Thyroid Stimulating Hormone
- E) Norepinephrine



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

- A) Testosterone
- B) Insulin
- C) Cortisol
- D) Thyroxine
- E) Estrogen

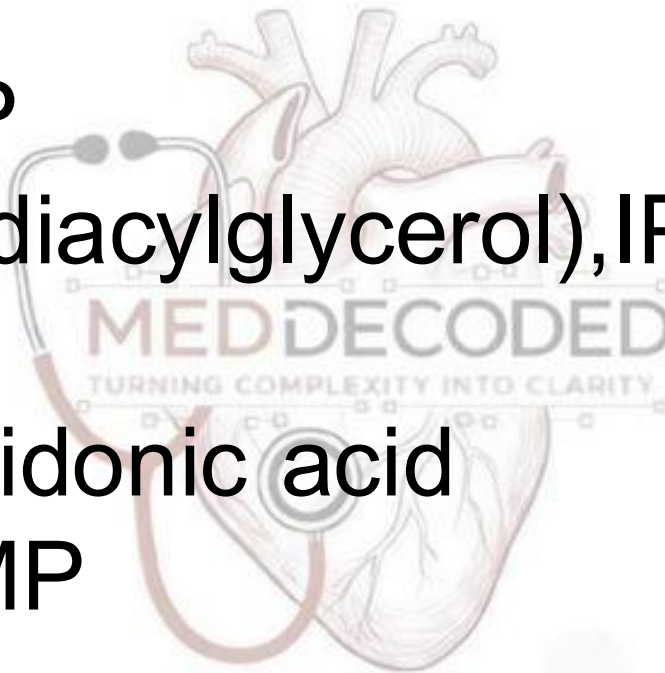


Answer: B

Insulin is a peptide and protein hormone

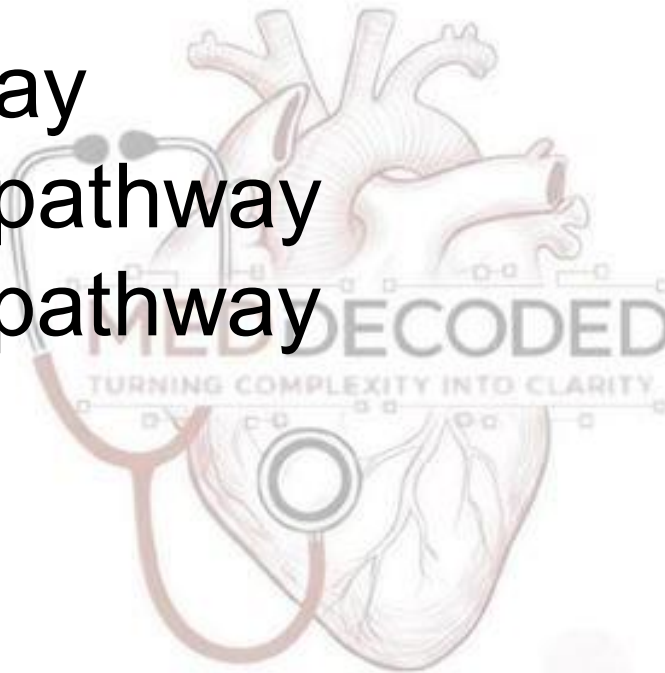
18. α 1-Adrenergic receptors are coupled to which Enzyme-Product:

- A) Adenylyl Cyclase-cAMP
- B) Guanylyl Cyclase-cGMP
- C) Phospholipase C-DAG(diacylglycerol), IP3 (inositol triphosphate)
- D) Phospholipase A-arachidonic acid
- E) Phosphodiesterase-cAMP



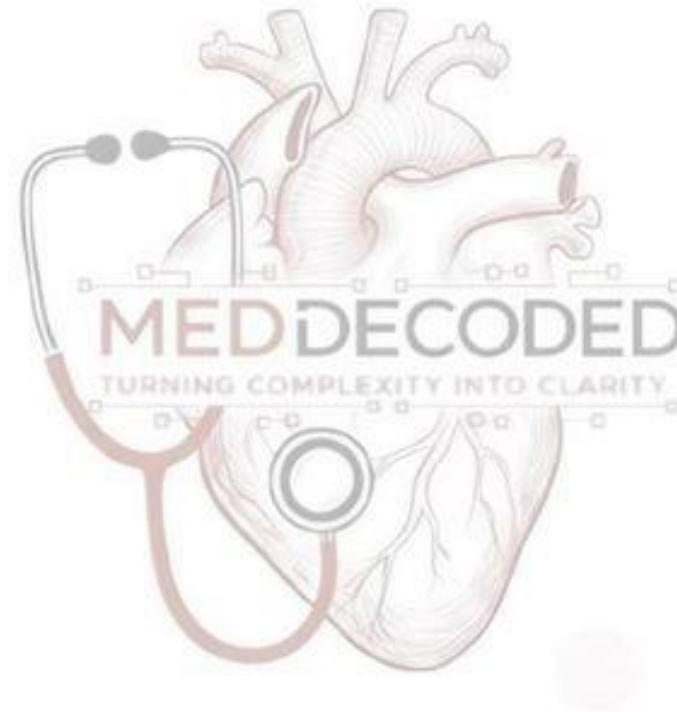
19. Leptin hormone induces its effect mainly through:

- A) PKA-CREB pathway
- B) JAK-STAT pathway
- C) Ca^{++} -Calmodulin pathway
- D) Adenylyl cyclase -cAMP pathway
- E) Guanylyl cyclase-cGMP pathway



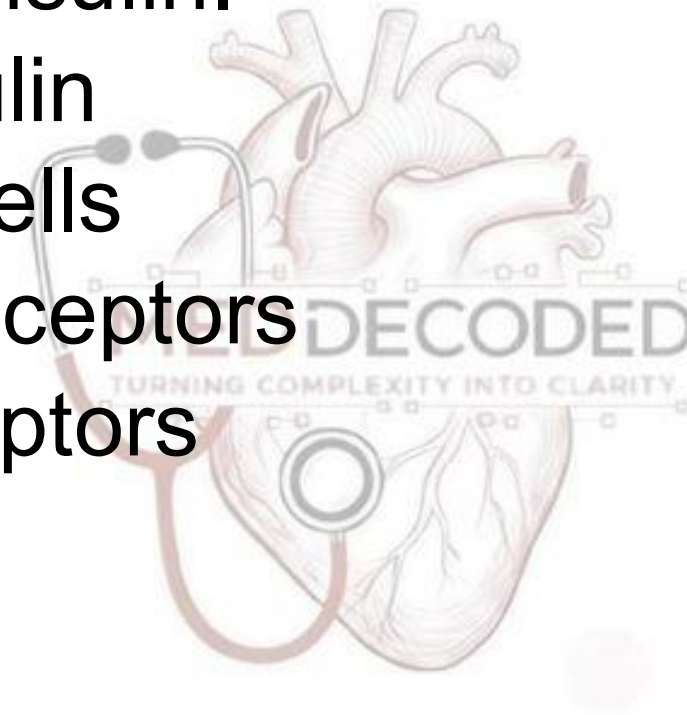
20. The type of signaling when the cell that secretes the signal is also the target is called:

Contact-dependent
Endocrine
Paracrine
Autocrine



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

Decreased metabolism of insulin.
Increased clearance of insulin
Death of insulin secreting cells
Desensitization of insulin receptors
Upregulation of insulin receptors



Answer: D

Exp! Insulin receptors on the cell surface either decrease in number or become less responsive to the insulin molecule

22. Location of cellular receptor proteins depend mainly on:

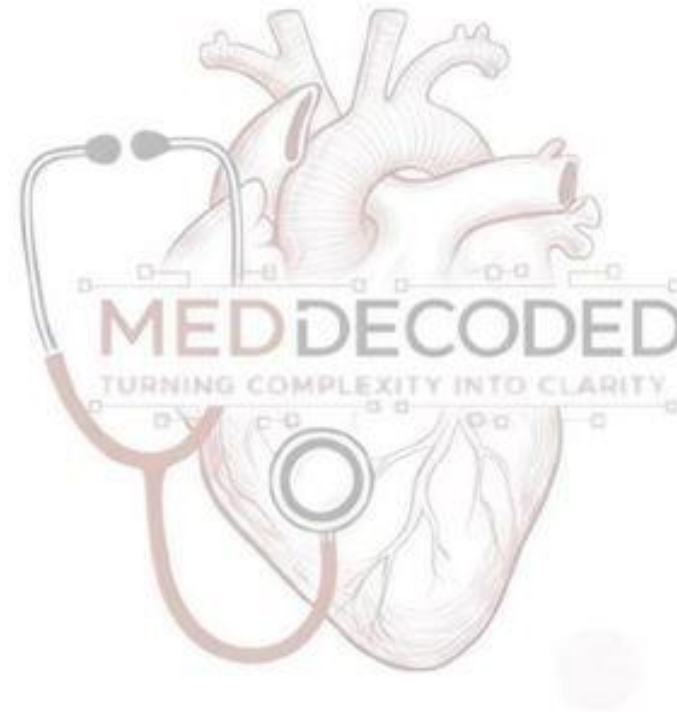
Chemical class of hormone

Function of hormone

Site of release

Type of cell

Half-life of hormone



Answer: A

Exp!

Hydrophilic = membrane receptor, Lipophilic = intracellular receptor

23. Insulin receptor is an example of:

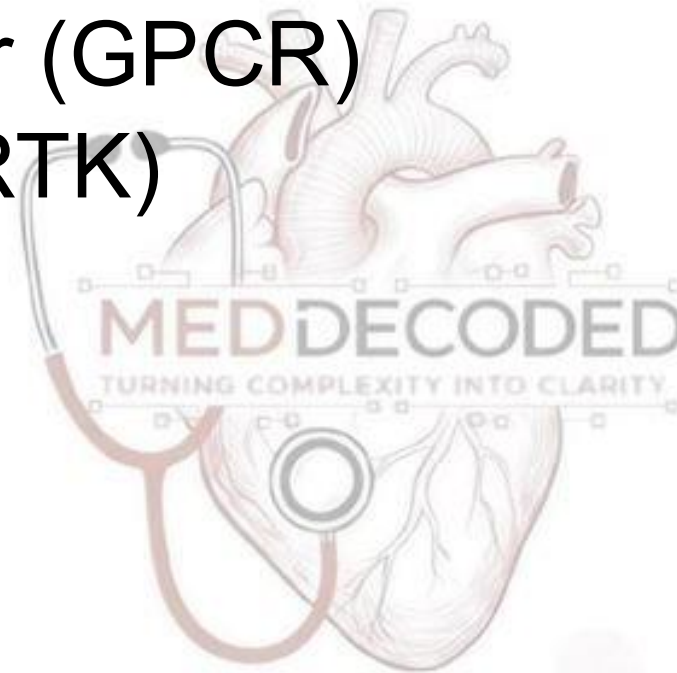
Ionotropic receptors

Metabotropic receptors

G Protein Coupled Receptor (GPCR)

Receptor Tyrosine kinase (RTK)

E) Voltage gated channel



24. Epinephrine may have the following second messengers?

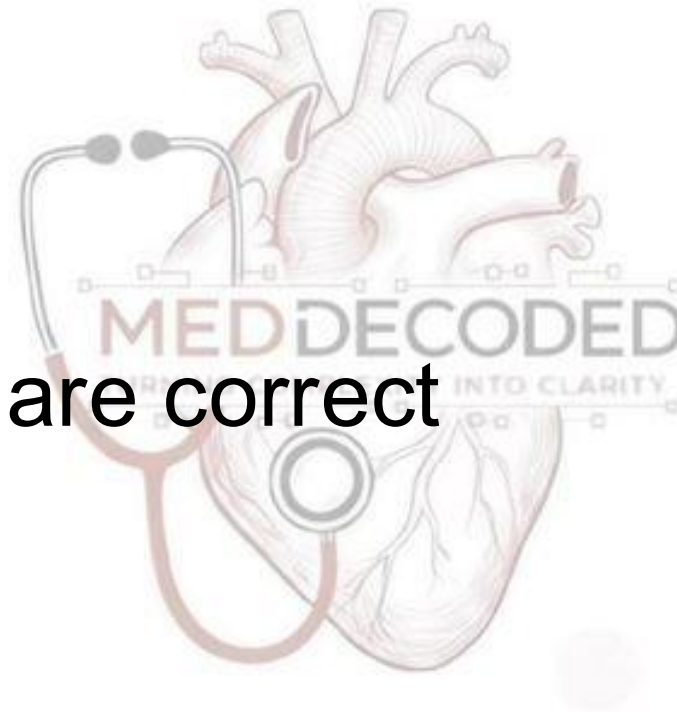
cAMP

Ca⁺⁺

IP3

DAG

All of the above mentioned are correct



Answer: E

Exp! Epinephrine and norepinephrine can act on two main types of receptors: alpha (Work mainly through intracellular calcium (Ca²⁺)) and beta (Work through the cyclic AMP (cAMP) pathway)

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

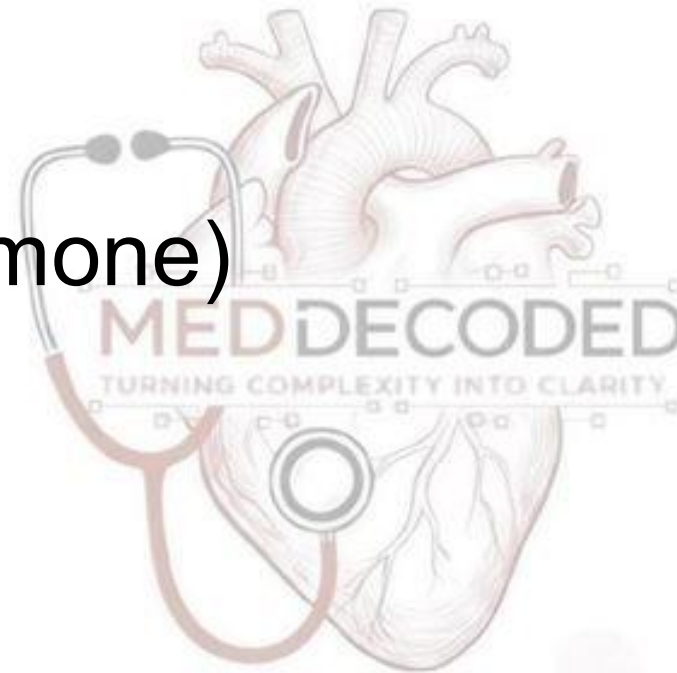
Glucagon receptor

β -adrenergic receptor

Insulin receptor

Vasopressin (Antidiuretic hormone)

α 2-adrenergic receptor



Answer: C

Insulin receptor does not belong to the G-protein coupled receptor (GPCR) family. Instead, it is a Receptor Tyrosine Kinase (RTK), which is an enzyme-linked receptor.

26. Which of the following is a derivative of Tyrosine:

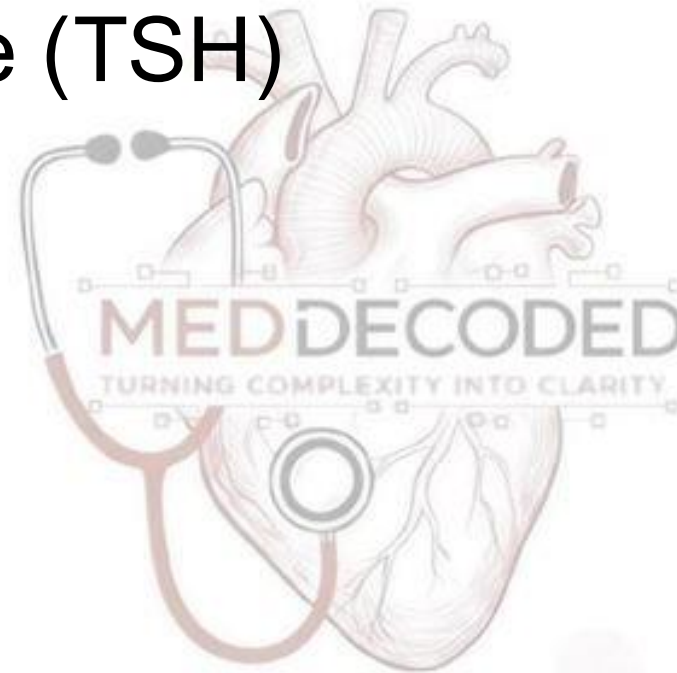
Insulin

Acetylcholine

Thyroid stimulating hormone (TSH)

Growth hormone

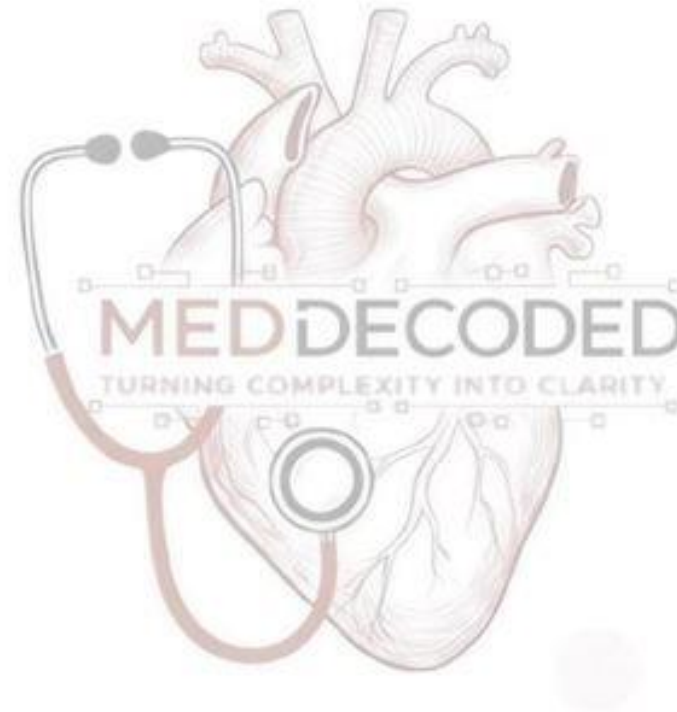
Norepinephrine



Answer: E

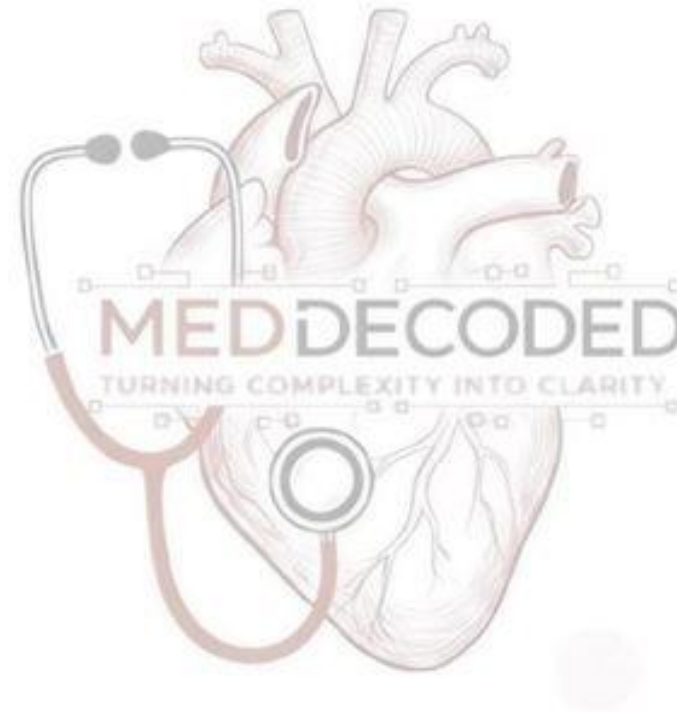
27. _____ refers to very strong binding (large negative ΔG and a very small K_d). It's also referred to the association or dissociation constant which is often referred to as the "binding" constant

- A) Specificity
- B) Affinity
- C) Desensitization
- D) Priming effect
- E) Half-life



28. Which of the following has the shortest half-life?

Insulin Cortisol
Thyroxine
Testosterone
Aldosterone



Answer: A

Peptide hormones (proteins) generally have a shorter half-life. In contrast, lipid-soluble hormones usually have a longer half-life.

29. TGF beta (transforming growth factor) receptor is an example of :

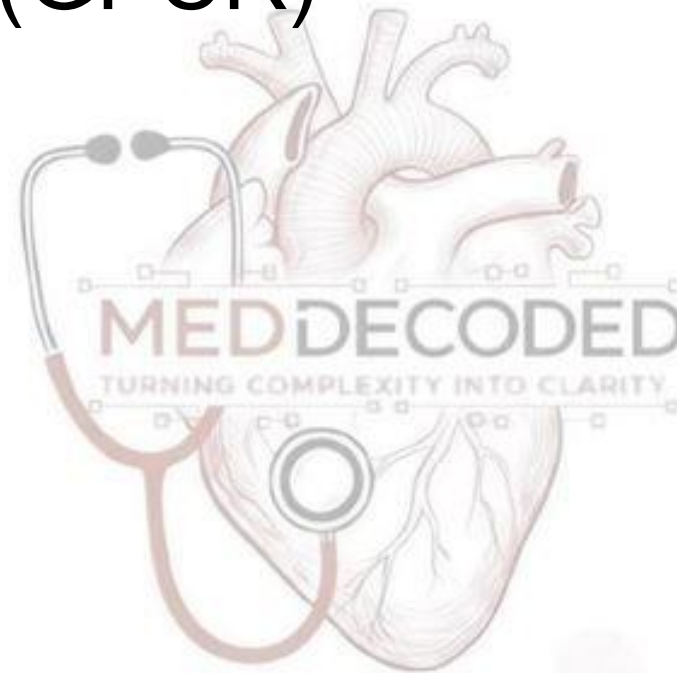
G protein coupled receptor (GPCR)

Voltage-gated channel

Enzyme linked receptors

Ionotropic receptors

Metabotropic receptors



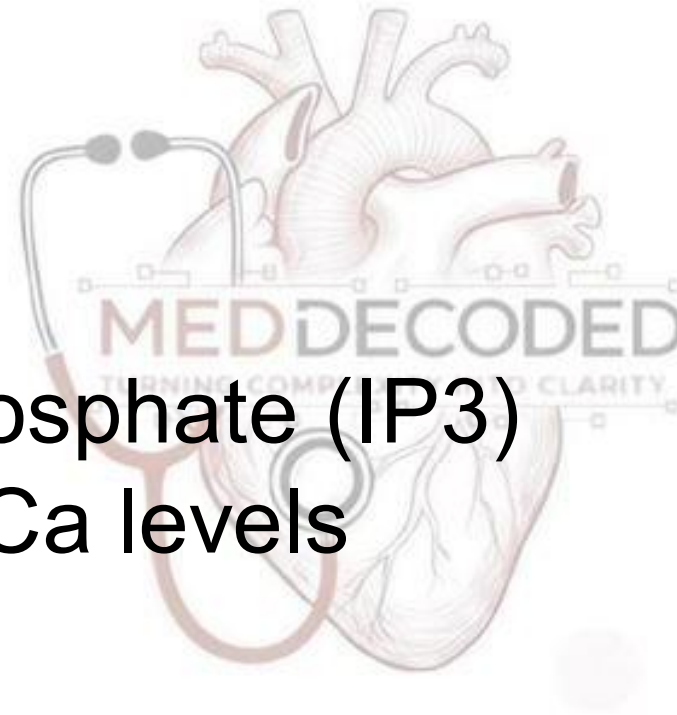
Answer: C

30. Which of the following changes would be expected to occur with increased binding of a hormone to plasma proteins?

- A. Increase in hormone activity
- B. Decrease in half-life of the hormone
- C. Increase in metabolism and breakdown of the hormone
- D. Decrease in plasma clearance of the hormone
- E. Increase in degree of negative feedback exerted by the hormone

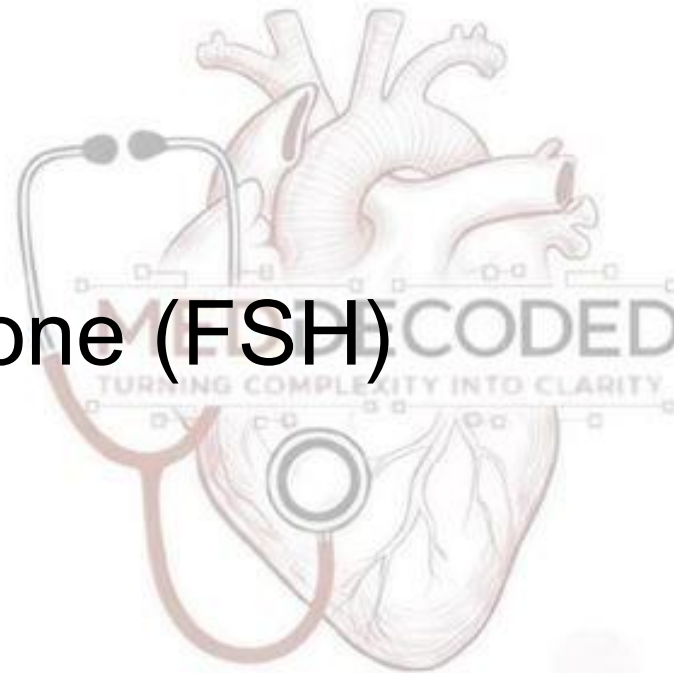
31. An experimental drug was designed to inhibit phosphodiesterase hormone. What do you expect to occur intracellularly?

- A. Increase in DAG
- B. Increase in cAMP
- C. Increase in STAT
- D. Decrease in inositol triphosphate (IP3)
- E. Decrease in intracellular Ca levels



32. All of the following must have plasma membrane receptors to transduce their effects EXCEPT:

- A. Aldosterone
- B. Glucagon
- C. Growth hormone
- D. Follicle-stimulating hormone (FSH)
- E. ACTH



Answer: A

33. The following is CORRECT about second messenger cAMP cellular actions:

- A. It can activate JAK mediated phosphorylation of STAT which translocates to the nucleus and modulate gene expression.
- B. It can translocate to the nucleus to bind and activate cAMP response element.
- C. It can only modulate cytosolic enzymes functions by activating PKA.
- D. It can stimulate gene expression by activating PKA-CREB.
- E. Once cAMP is generated, the signal is amplified and can't be turned off.

34. Low K_d (dissociation) constant for a hormone to a certain receptor means:

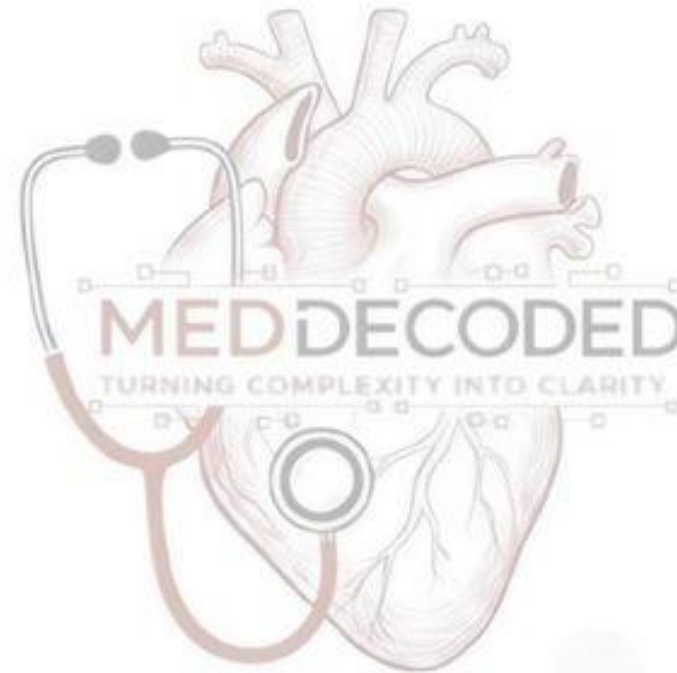
- A. Clearance rate of that hormone is low.
- B. Half-life of that hormone is short.
- C. Concentration of the hormone needed to bind the receptors is high.
- D. Binding percentage to plasma protein is low.
- E. Affinity of the hormone to the receptor is high.

Answer: E

K_d (dissociation constant) is the concentration of hormone needed to occupy 50% of receptors. So If only a small amount of hormone is needed to bind receptors → the hormone binds strongly → high affinity → low K_d .

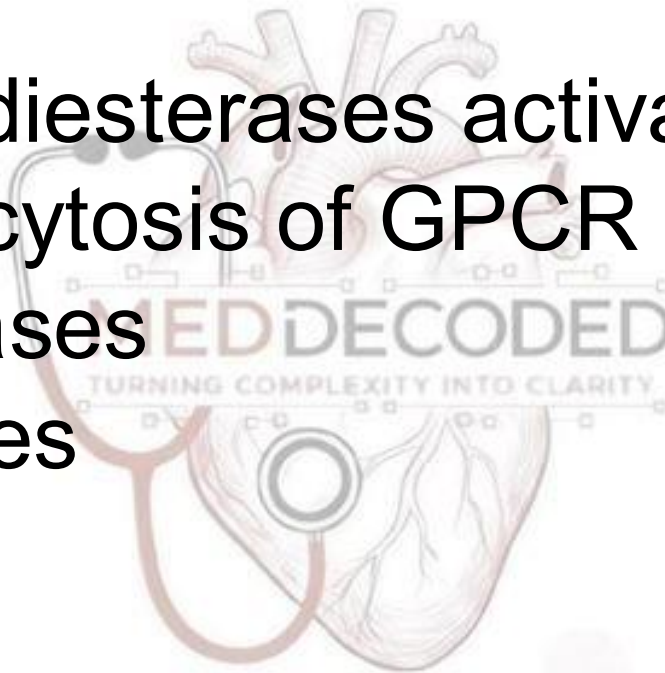
35. Deficiency of the following vitamin will affect thyroid hormones (T3 and T4) intracellular signalling?

- A. Vitamin K
- B. Vitamin C
- C. Vitamin A
- D. Vitamin D
- E. Vitamin B12



36. All of the following are mechanism of turning off GPCR signal EXCEPT:

- A) $G\alpha$ hydrolyzes GTP
- B) cAMP-induced Phosphodiesterases activation
- C) β -Arrestin-induced endocytosis of GPCR
- D) Activation of phospholipases
- E) Activation of phosphatases



37. In the lab experiment, cultured smooth muscle cells were treated with a drug that mimics (يشبه) a hormone. After treatment, levels of cyclic GMP were significantly increased. Which of the following hormones the drug might mimic and which type of receptors the drug stimulated?

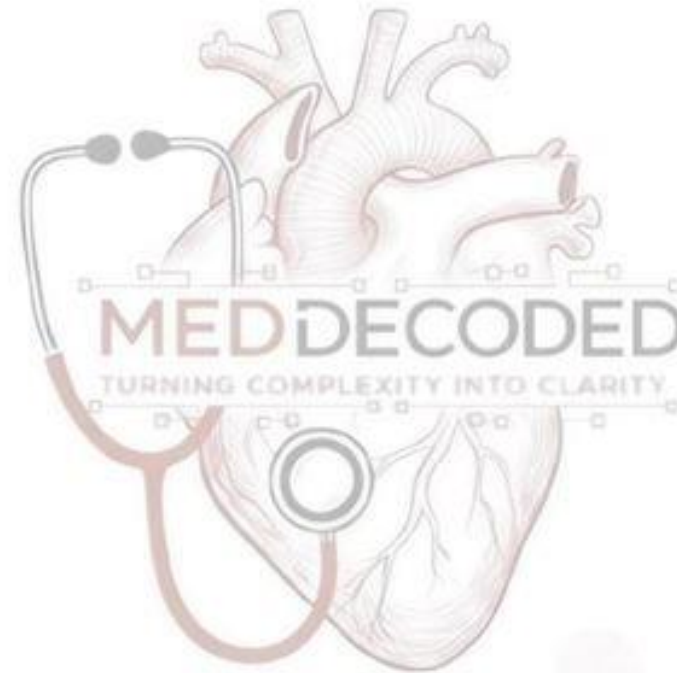
- A) Epinephrine, G protein coupled receptors (alpha s)
- B) Acetyl choline, G protein coupled receptors (alpha q)
- C) Atrial Natriuretic Peptide (ANP), Enzyme linked receptor
- D) Growth hormone, Enzyme linked receptor
- E) Glucagon, G protein coupled receptors (alpha s)

Answer: C

Source: Dr Faisal's slides P.122 the left part of the diagram. The drug increased cGMP, and ANP is the only hormone in the options that uses cGMP as a second messenger. It works by binding to an enzyme-linked receptor to produce cGMP.

38. The following hormone signals to the nucleus by activating JAK-STAT pathway :

- a. Calcitonin
- b. Epinephrine
- c. Dopamine
- d. Insulin
- e. Leptin



39. Prostaglandins are paracrine hormones that are classified as :

Lipid soluble amine derivative

Lipid soluble arachidonic acid derivative

Water soluble amine derivative

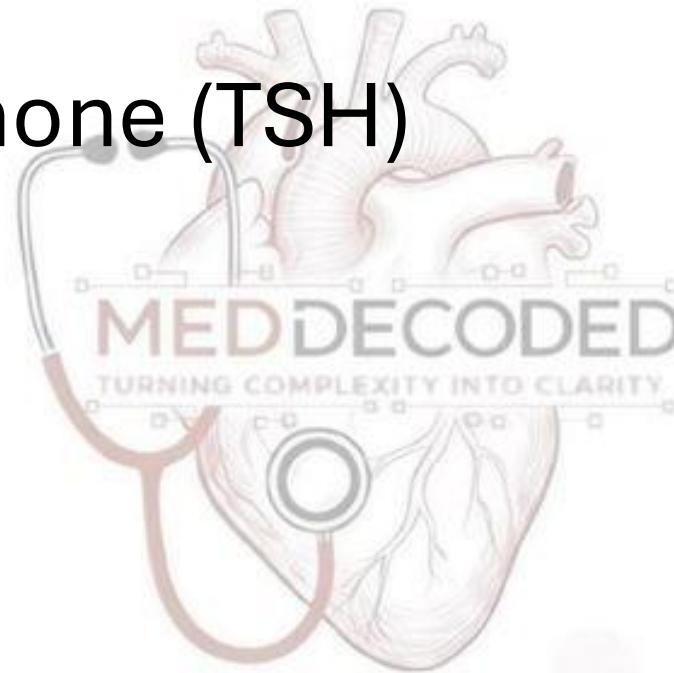
Water soluble polypeptide derivative

Water soluble arachidonic acid derivative



40. Which of the following has the shortest half-life and highest metabolic clearance?

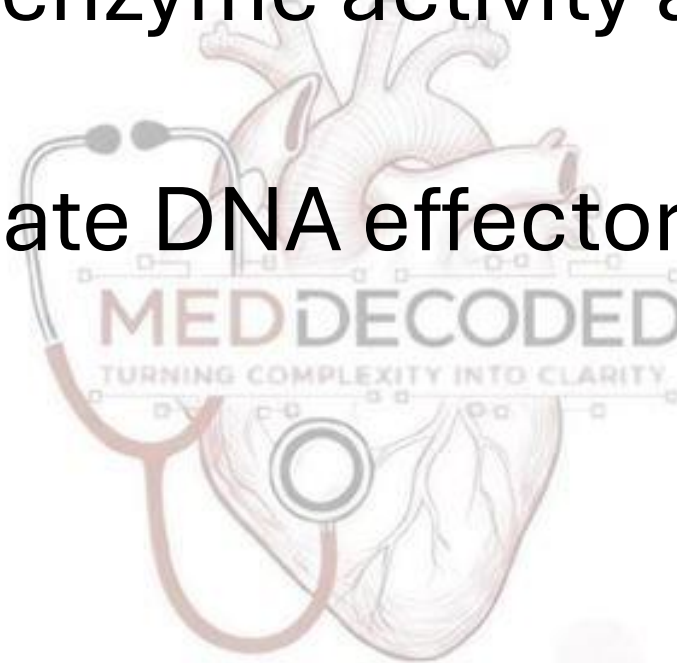
- A) Insulin
- B) Thyroid stimulating hormone (TSH)
- C) Aldosterone
- D) Estrogen
- E) T3



Answer: A

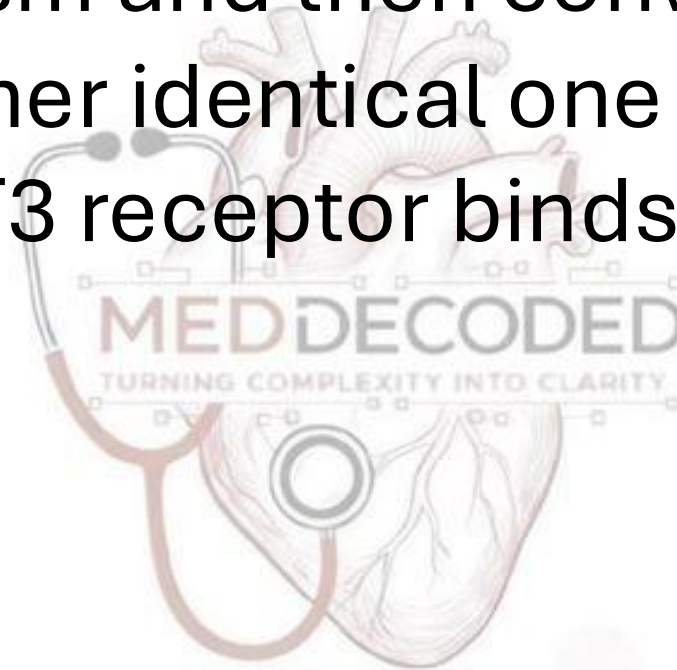
41. Which of the following is correct about cAMP?

- A) It can modulate cellular enzyme activity only
- B) It can modulate cellular enzyme activity and mediate gene expression
- C) It can bind to and stimulate DNA effector regions



42. Which of the following statements about thyroid hormones is incorrect?

- A) T4 can enter the cytoplasm and then convert to T3
- B) T3 receptors link to another identical one and bind to DNA
- C) The DNA domain of the T3 receptor binds to DNA



43. Epinephrine in the liver binds to:

- A. Beta receptors and alpha 1 receptors, thus increasing cAMP and IP3, Ca^{++} , DAG
- B. Beta receptors and alpha 2 receptors, thus decreasing cAMP and IP3
- C. Alpha 1 receptors only, causing a decrease in intracellular Ca^{++} levels
- D. Beta receptors only, which utilize the JAK-STAT pathway to decrease glucose output

Answer: A



اللهم آتنا في الدّنيا حسنة
وفي الآخرة حسنة وقنا عذاب النار.

Best of luck

For any feedback, scan the code or click on it.

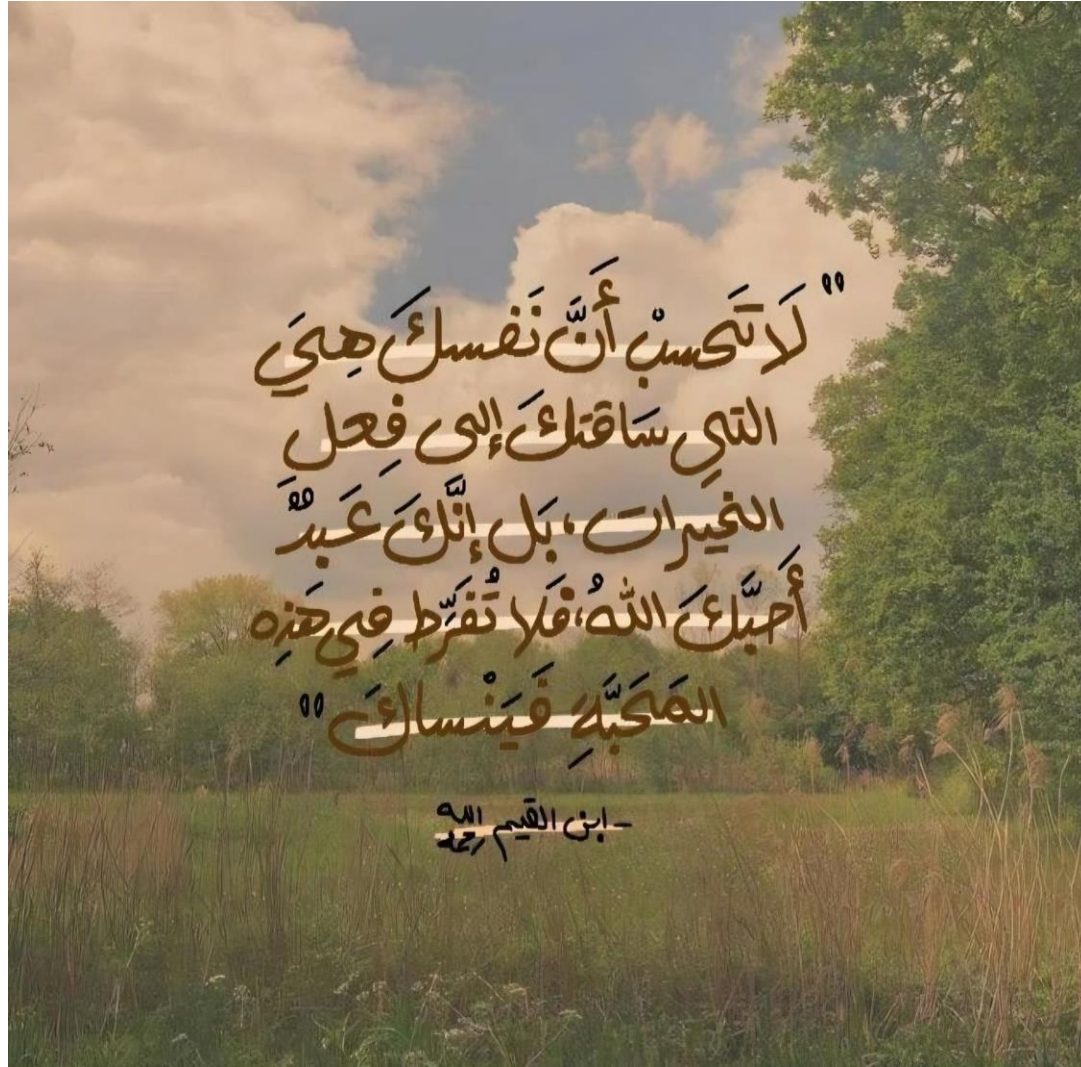


Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			

رسالة من الفريق العلمي:

واعلم يا بُني أنَّ الأيام تُبسط سَاعَاتٍ والسَّاعاتُ تُبسط أنفاسًا،
وكلُّ نفسٍ خزانةٌ، فاحذر أن يذهب نفسٌ بغير شيءٍ، فترى في
القيامة خزانةً فارغةً فتندم.

وانظر كلَّ ساعةٍ من سَاعَاتِكَ بماذا تذهبُ، فلا تودعها إلا إلى
أشرفِ ما يُمكن، ولا تهملِ نفسك، وعَودها أشرفُ ما يَكُون منَ
العَمَلِ وأَحسنه.



• ابنُ الجوزي - رحمه الله -