

# TEST BANK

Physiology  
#MSS



## Action potential

1. The major cation inside the cell is :
  - a. Ca
  - b. Na
  - c. K
  - d. PO<sub>4</sub>
2. The major cation outside the cell is :
  - a. Na
  - b. K
  - c. PO<sub>4</sub>
  - d. Ca
3. All of the following contribute to the resting state of action potential except:
  - a. High concentration of Na outside the cell
  - b. More Na channel in plasma membrane than K channel
  - c. The selective permeability of plasma membrane doesn't allow for protein and ATP to leave the cell
  - d. Electrogenic nature of the Na<sup>+</sup>/K<sup>+</sup> pump
4. Myocytes produce electrical signal depending of which type of channels :
  - a. Mechanical gated channels
  - b. Ligand gated channels
  - c. Voltage gated channels
  - d. All of the above

Answers : 1-C. 2-A. 3-B. 4-D

5. what is the difference between graded potential (**stimuli**) and action potential :
- Graded potential allow communication over short distances while action potential over long distances
  - Graded potential arise mainly at trigger zone
  - Action potential is slower than graded potential
  - Action potential allow summation
6. Local anesthetics are drugs that block pain and other somatic sensation by :
- Block the opening of K voltage gated channel
  - Accelerate the opening of Na voltage gated channel
  - Block the opening of Na voltage gated channel
7. All of the following are the difference between **graded** and action potential except:
- Action potential is decremental
  - Action potential has a refractory period while graded potential is not
  - Summation can occur in graded potential
  - Mechanical and ligand gated channels are present in graded potential
8. What is the neurotransmitter in the NMJ:
- ACh
  - Dopamine
  - Adrenaline
  - Nor-adrenaline

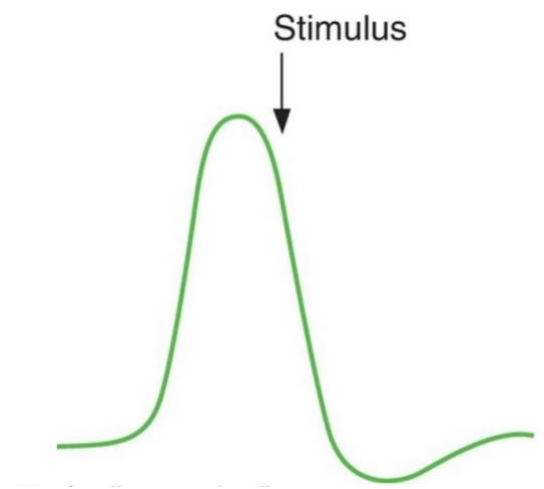
Answers: 5-A. 6-C 7-A. 8-A.

9. Which channel in the presynaptic membrane opens when the action potential reach the terminal part of the axon:
- Na voltage gated channel
  - K voltage gated channel
  - Cl voltage gated channel
  - Ca voltage gated channel
10. Which of the following facilitate exocytosis of the Ach vesicles :
- flow of the Na ions inside the cell
  - flow of the Ca ions inside the cell
  - flow of the K ions outside the cell
  - flow of the Ca ions outside the cell
11. Which of the following can strongly activate the Na /K pumps:
- High Cl outside the cell
  - Low proteins inside the cell
  - High phosphate outside the cell
  - High Na inside the cell

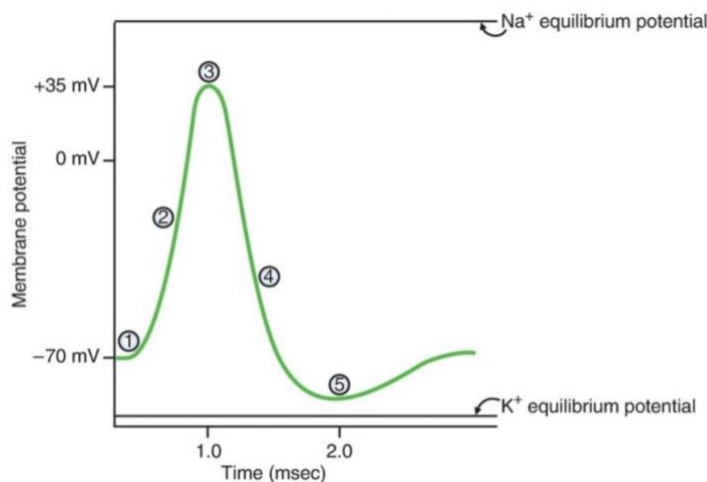
Answer:9-D. 10-B 11-D

12. During a nerve action potential, a stimulus is delivered as indicated by the arrow shown in the following figure. In response to the stimulus, a second action potential:

- A. of smaller magnitude will occur
- B. of normal magnitude will occur
- C. Will not occur
- D. will occur but will not have an overshoot
- E. of normal magnitude will occur but will be delayed



The following diagram of a nerve action potential applies to questions 13-15 :



13. At which labeled point on the action potential is  $K^+$  closest to electrochemical equilibrium?
- A. 1
  - B. 2
  - C. 3
  - D. 4
  - E. 5
14. What process is responsible for the change in membrane potential that occurs between point 1 and point 3
- A. Movement of  $Na^+$  into the cell
  - B. Movement of  $Na^+$  out of the cell
  - C. Movement of  $K^+$  into the cell
  - D. Movement of  $K^+$  out of the cell
  - E. Activation of the  $Na^+K^+$  pump
  - F. Inhibition of the  $Na^+K^+$  pump
15. What process is responsible for the change in membrane potential that occurs between point 3 and point 4:
- A) Movement of  $Na^+$  into the cell
  - B) Movement of  $Na^+$  out of the cell
  - C) Movement of  $K^+$  into the cell
  - D) Movement of  $K^+$  out of the cell
  - E) Activation of the  $Na^+K^+$  pump
  - F) Inhibition of the  $Na^+K^+$  pump

Answers: 12-C. 13-E. 14-A. 15-D

16. which of the following sentence is wrong about receptor in the post synaptic membrane in the NeuroMuscular junction (NMJ):
- a) it's a ligand gated channels
  - b) composed of 5 subunits
  - c) required 2 Ach molecules to open
  - d) It's composed of 8 sub units

Ans : D



اللهم همة

## Skeletal muscles

1. regarding myasthenia gravis :
  - a. is an untreatable disease and we use drug to minimize the symptoms
  - b. caused by excessive release of acetylcholine
  - c. it's an autoimmune disease that affect the neuromuscular junction
  - d. there is an increase of the AchRs and Ca voltage gated channels
2. which sentence is wrong about muscle structure :
  - a. composed of repeated sarcomere
  - b. 98% of fiber is innervated by multiple nerve ending
  - c. The major structure is actin and myosin protein
  - d. The sarcoplasmic reticulum storage high amount of Ca
3. The action potential reaches all muscles fiber due to the presence of :
  - a. Z line
  - b. M line
  - c. T tubules
  - d. Actin
4. Which receptor senses the action potential when it reaches the T tubules:
  - a. Ryanodine receptors
  - b. Ca release channel
  - c. Dihydropyridine receptors
  - d. None of above

Answer: 1- A&C 2- B. 3- C. 4-C



5. Regarding troponin which one is true :
- a. Composed of four subunit
  - b. Troponin I has strong affinity to actin
  - c. Troponin T has strong affinity to actin
  - d. Troponin C has strong affinity to chloride ions
6. Following the structure of the actin filament which one is wrong :
- a. Composed of actin, tropomyosin and troponin
  - b. Actin backbone composed of triple stranded F-actin helix
  - c. In resting state, the tropomyosin wrap on the top of active site of actin
  - d. The strand of F-actin helix composed of polymerized G-actin molecules
7. Following the contraction cycle which one is wrong:
- a. The contraction of muscle requires Ca
  - b. The myosin head need ATP to detachment from the actin
  - c. The myosin head tilt the actin filament away from the arm of the cross bridge
  - d. Before contraction ATP attach to the myosin head to become oriented and energized
8. One of the following process require energy in the muscle:
- a. Release of the Ca ions from the sarcoplasmic reticulum
  - b. Pulling the actin filament toward the M line by myosin head
  - c. Require for entering of Na to the cell
  - d. Uncovering the myosin binding site in the actin filament

Answer: 5-B. 6-B 7-C. 8-B

9. The first source of energy that reconstitute the ATP is :
- Oxidative phosphorylation
  - Aerobic glycolysis
  - Anaerobic glycolysis
  - Phosphocreatine
10. What is the importance of glycolysis:
- The rate of ATP formation 2.5 times rapid than classic ATP formation
  - Can't occur in the absence of oxygen
  - Lasting for long duration around 1 hour
  - Happen in the mitochondria
11. All of the following are features of slow fibers except:
- Slow fiber is smaller than fast fiber
  - Contain numerous numbers of mitochondria
  - Have an extensive sarcoplasmic reticulum than fast fibers
  - Posses high number of myoglobin, an iron-containing protein
12. which of the following is characteristics of fast fibers:
- contain less blood supply compared with slow fibers.
  - depending on the oxidative phosphorylation as source of energy
  - have low rate of ATP hydrolysis.
  - have high resistant to fatigue

Answer: 9-D 10-A 11-c 12-A

13. what is the difference between red and white fibers:
- red fibers have slow contraction velocity than white fibers
  - white fibers have an extensive sarcoplasmic reticulum compared with red fibers
  - red fibers have less glycogen store than white fibers.
  - all of the above
14. The ends of the actin filaments are anchored (attached) to the:
- M-line
  - Z-line
  - Perimysium
  - Sarcoplasmic reticulum
15. When a muscle fibre shortens, the following also shortens:
- Sacromere
  - Actin filament
  - Myosin filament
  - Z line
16. In regard to the cross-bridge (CB) power stroke, it is true that:
- In concentric contractions, the CB power stroke pulls the actin filament toward the center of the sarcomere, causing sarcomere shortening.
  - In isometric contractions, the CB power stroke pulls the actin filament straight down, preventing shortening or lengthening.
  - All of above

Answer:13- D, 14- B , 15- A, 16-A

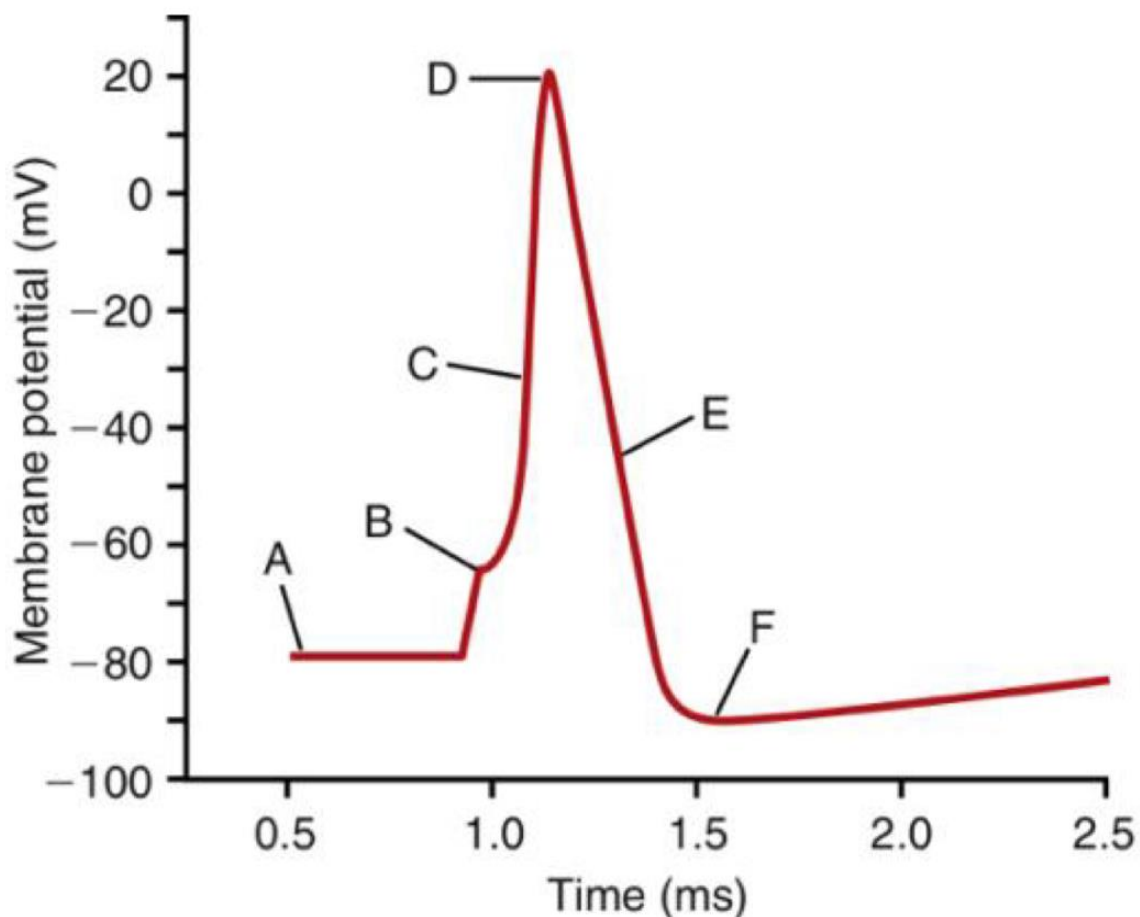
17. During one cross-bridge (CB) cycle:
- The CB binds to troponin.
  - ATP binds to the actin binding site.
  - One molecule of ATP is used.
  - The CB performs two power-strokes.
18. In excitation-contraction coupling:
- The muscle action potential propagates along the sarcolemma and down the transverse tubules.
  - Ca<sup>2+</sup> released from the sarcoplasmic reticulum binds to tropomyosin.
  - Troponin blocks binding of myosin heads to actin filaments.
  - Relaxation occurs when Ca<sup>2+</sup> is excreted from the muscle fibre.
19. The sarcoplasmic reticulum does not:
- Surround each myofibril.
  - Release Ca<sup>2+</sup> in response to a muscle action potential.
  - Has a Ca<sup>2+</sup> "pump" in its membrane.
  - Make up about 95% of the contents of a muscle fibre.
20. The force of a tetanic contraction is greater than that of a twitch contraction because:
- More acetylcholine is released at the neuromuscular junction per nerve impulse.
  - More Ca<sup>2+</sup> is released in a tetanic contraction.
  - The muscle action potentials travel faster along the transverse tubules.
  - The muscle action potentials are smaller during a tetanic contraction.

Answer: 17- C. 18- A. 19- D. 20-B

21. Muscle fiber A contraction is stronger than M.Fiber B contraction partly. The reason is ? ( both have the same motor unit)
- More muscle fibers in A are activated
  - More cross-bridges are attached to actin at given time
  - Muscles fiber are conducting muscle action potential at higher frequency
  - More ATP in used in each cross bridge cycle
22. As shortening velocity increases, concentric force decreases because:
- There is a progressive decrease in the number of attached cross-bridges.
  - Cross-bridge cycles become slower.
  - Muscle action potentials propagate more slowly.
  - All of the above.
23. The decrease in active force that occurs at lengths longer than the optimal length ( The muscle length at which maximal active force occurs) is caused by:
- Overlap of actin filaments with each other.
  - Neural inhibition.
  - Insufficient  $Ca^{2+}$  release.
  - Insufficient overlap of actin and myosin filaments.
24. The muscle strength could be altered by:
- Training
  - Fatigue
  - Injury
  - All of the above

Answer:21- B ( not sure) 22-A. 23-D. 24-D

25. Weight lifting can result in a dramatic increase in skeletal muscle mass. This increase in muscle mass is primarily attributable to which of the following?
- a. Fusion of sarcomeres between adjacent myofibrils
  - b. Hypertrophy of individual muscle fibers
  - c. Increase in skeletal muscle blood supply
  - d. Increase in the number of motor neurons
  - e. Increase in the number of neuromuscular junctions
26. **The figure shows** the change in membrane potential during an action potential in a giant squid axon. Refer to it when answering Questions 1 and 2.

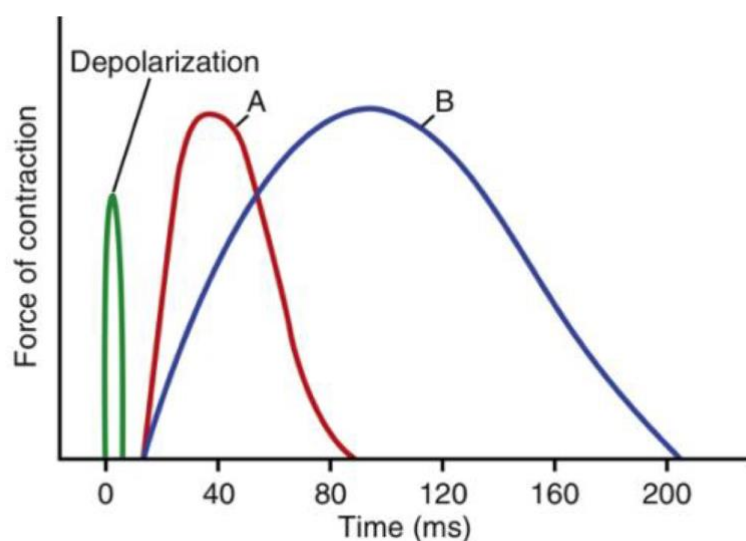


Answer(25): B

1. Which of the following is primarily responsible for the change in membrane potential between points B and D?
- a. Inhibition of the  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase
  - b. Movement of  $\text{K}^+$  into the cell
  - c. Movement of  $\text{K}^+$  out of the cell
  - d. Movement of  $\text{Na}^+$  into the cell
  - e. Movement of  $\text{Na}^+$  out of the cell

2. is primarily responsible for the change in membrane potential between points D and E?
- a. Inhibition of the  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase
  - b. Movement of  $\text{K}^+$  into the cell
  - c. Movement of  $\text{K}^+$  out of the cell
  - d. Movement of  $\text{Na}^+$  into the cell
  - e. Movement of  $\text{Na}^+$  out of the cell

27. **The illustrates** the single isometric twitch characteristics of two skeletal muscles, A and B, in response to a depolarizing stimulus. Refer to it when answering Questions 1 and 2.



Answers: 26-D/C

1. Which of the following best describes muscle B compared with muscle A?
  - a. Adapted for rapid contraction
  - b. Composed of larger muscle fibers
  - c. Fewer mitochondria
  - d. has smaller muscles fibers
  - e. Less extensive blood supply
  
2. The delay between the termination of the transient depolarization of the muscle membrane and the onset of muscle contraction observed in both muscles A and B reflects the time necessary for which of the following events to occur?
  - A. ADP to be released from the myosin head
  - B. ATP to be synthesized
  - C.  $Ca^{++}$  to accumulate in the sarcoplasm
  - D. G-actin to polymerize into F-actin
  - E. Myosin head to complete one cross-bridge cycle
  
28. Sarcoplasm A 55-year-old woman visits her physician because of double vision, eyelid droop, difficulty chewing and swallowing, and general weakness in her limbs. All these symptoms worsen with exercise and occur more frequently late in the day. The physician suspects myasthenia gravis and orders a Tensilon test. The test is positive. Use this information when [answering Questions 1? 2.](#)

Answers: 27-D/C



1. What is the most likely basis for the symptoms described in this patient?
- A. Autoimmune response
  - B. Botulinum toxicity
  - C. Depletion of voltage-gated  $Ca^{++}$  channels in certain motor neurons
  - D. Development of macro motor units after recovery from poliomyelitis
  - E. Overexertion
2. Which drug would likely alleviate this patient's symptoms:
- A. Atropine
  - B. Botulinum toxin antiserum
  - C. Curare
  - D. Halothane
  - E. Neostigmine
29. A 17-year-old soccer player sustained a fracture to the left tibia. After her lower leg has been in a cast for 8 weeks, she is surprised to find that the left gastrocnemius muscle is significantly smaller in circumference than it was before the fracture. What is the most likely explanation?
- A. Decrease in the number of individual muscle fibers in the left gastrocnemius
  - B. Decrease in blood flow to the muscle caused by constriction from the cast
  - C. Temporary reduction in actin and myosin protein synthesis
  - D. Increase in glycolytic activity in the affected muscle
  - E. Progressive denervation

Answers: 28- A/E. 29-C

30. Which characteristic or component is shared by skeletal muscle and smooth muscle?

- A. Thick and thin filaments arranged in sarcomeres
- B. Troponin
- C. Elevations of intracellular ( $\text{Ca}^{+2}$ ) for excitation-contraction coupling
- D. Spontaneous depolarization of the membrane potential
- E. High degree of electrical coupling between cells

31. Repeated stimulation of a skeletal muscle fiber causes a sustained contraction (tetanus). Accumulation of which solute in intracellular fluid is responsible for the tetanus?

- A.  $\text{Na}^{+}$
- B.  $\text{K}^{+}$
- C.  $\text{Cl}^{-}$
- D.  $\text{Mg}^{++}$
- E.  $\text{Ca}^{++}$

32. The correct temporal sequence for events at the neuromuscular junction is :

- A. action potential in the motor nerve; depolarization of the muscle end plate; uptake of  $\text{Ca}^{+2}$  into the presynaptic nerve terminal
- B. Uptake of  $\text{Ca}^{+2}$  into the presynaptic terminal; release of acetylcholine (ACh); depolarization of the muscle end plate
- C. release of ACh; action potential in the motor nerve; action potential in the muscle
- D. uptake of  $\text{Ca}^{+2}$  into the motor end plate; action potential in the motor end plate; action potential in the muscle
- E. release of ACh; action potential in the muscle end plate; action potential in the muscle

Answers: 30- C . 31-E . 32-B & E

33. A muscle cell has an intracellular  $[Na^+]$  of 14 mM and an extracellular  $[Na^+]$  of 140 mM. Assuming that  $2.3 RT/F = 60$  mV, what would the membrane potential be if the muscle cell membrane were permeable only to  $Na^+$ ?
- A. -80 mV
  - B. -60 mV
  - C. 0 mV
  - D. +60 mV
  - E. +80 mV
34. At the muscle end plate, acetylcholine (ACh) causes the opening of :
- A.  $Na^+$  channels and depolarization toward the  $Na^+$  equilibrium potential
  - B.  $K^+$  channels and depolarization toward the  $K^+$  equilibrium potential
  - C.  $Ca^{2+}$  channels and depolarization toward the  $Ca^{2+}$  equilibrium potential
  - D.  $Na^+$  and  $K^+$  channels and depolarization to a value halfway between the  $Na^+$  and  $K^+$  equilibrium potentials
  - E.  $Na^+$  and  $K^+$  channels and hyperdepolarization to a value halfway between the  $Na^+$  and  $K^+$  equilibrium potentials
35. Which of the following temporal sequences is correct for excitation–contraction coupling in skeletal muscle
- A. Increased intracellular  $[Ca^{2+}]$ ; action potential in the muscle membrane; cross-bridge formation
  - B. Action potential in the muscle membrane; depolarization of the T tubules; release of  $Ca^{2+}$  from the sarcoplasmic reticulum (SR)
  - C. Action potential in the muscle membrane; splitting of adenosine triphosphate (ATP); binding of  $Ca^{2+}$  to troponin C
  - D. Release of  $Ca^{2+}$  from the SR; depolarization of the T tubules; binding of  $Ca^{2+}$  to troponin C

Answers: 33-D. 34-D. 35-B

36. In skeletal muscle, which of the following events occurs before depolarization of the T tubules in the mechanism of excitation-contraction coupling

- A. Depolarization of the sarcolemmal membrane
- B. Opening of  $\text{Ca}^{2+}$  release channels on the sarcoplasmic reticulum (SR)
- C. Uptake of  $\text{Ca}^{2+}$  into the SR by  $\text{Ca}^{2+}$ -adenosine triphosphatase (ATPase)
- D. Binding of  $\text{Ca}^{2+}$  to troponin C
- E. Binding of actin and myosin

37. Which of the following causes rigor in skeletal muscle

- A. Lack of action potentials in motoneurons
- B. An increase in intracellular  $\text{Ca}^{2+}$  level
- C. A decrease in intracellular  $\text{Ca}^{2+}$  level
- D. An increase in adenosine triphosphate (ATP) level
- E. A decrease in ATP level

38. A 56-year-old woman with severe muscle weakness is hospitalized. The only abnormality in her laboratory values is an elevated serum  $\text{K}^{+}$  concentration. The elevated serum  $\text{K}^{+}$  causes muscle weakness because:

- A. The resting membrane potential is hyperpolarized
- B. the  $\text{K}^{+}$  equilibrium potential is hyperpolarized
- C. the  $\text{Na}^{+}$  equilibrium potential is hyperpolarized
- D.  $\text{K}^{+}$  channels are closed by depolarization
- E.  $\text{K}^{+}$  channels are opened by depolarization
- F.  $\text{Na}^{+}$  channels are closed by depolarization
- G.  $\text{Na}^{+}$  channels are opened by depolarization

Answers : 36-A. 37- E. 38- F

39. In contraction of gastrointestinal smooth muscle, which of the following events occurs after binding of  $Ca^{2+}$  to calmodulin

- A. Depolarization of the sarcolemmal membrane
- B.  $Ca^{2+}$ -induced  $Ca^{2+}$  release
- C. Increased myosin light chain kinase
- D. Increased intracellular  $Ca^{2+}$  concentration
- E. Opening of ligand gated  $Ca^{2+}$  channels

40. An inhibitory postsynaptic potential

- A. depolarizes the postsynaptic membrane by opening  $Na^{+}$  channels
- B. depolarizes the postsynaptic membrane by opening  $K^{+}$  channels
- C. hyperpolarizes the postsynaptic membrane by opening  $Ca^{2+}$  channels
- D. Hyperpolarizes the postsynaptic membrane by opening  $Cl^{-}$  channels

Answers: 39-C. 40- D

تم بحمد الله

هل يرى البحار عَرَضَ البحر من الشاطئ؟ أم يعتلي أمواجه الهوجاء مخاطراً! و هل ينال القرب من أنسه البُعد؟ أم من بذل في سبيله خطياً و مسيراً..

Q 1 & 32 have been  
edited