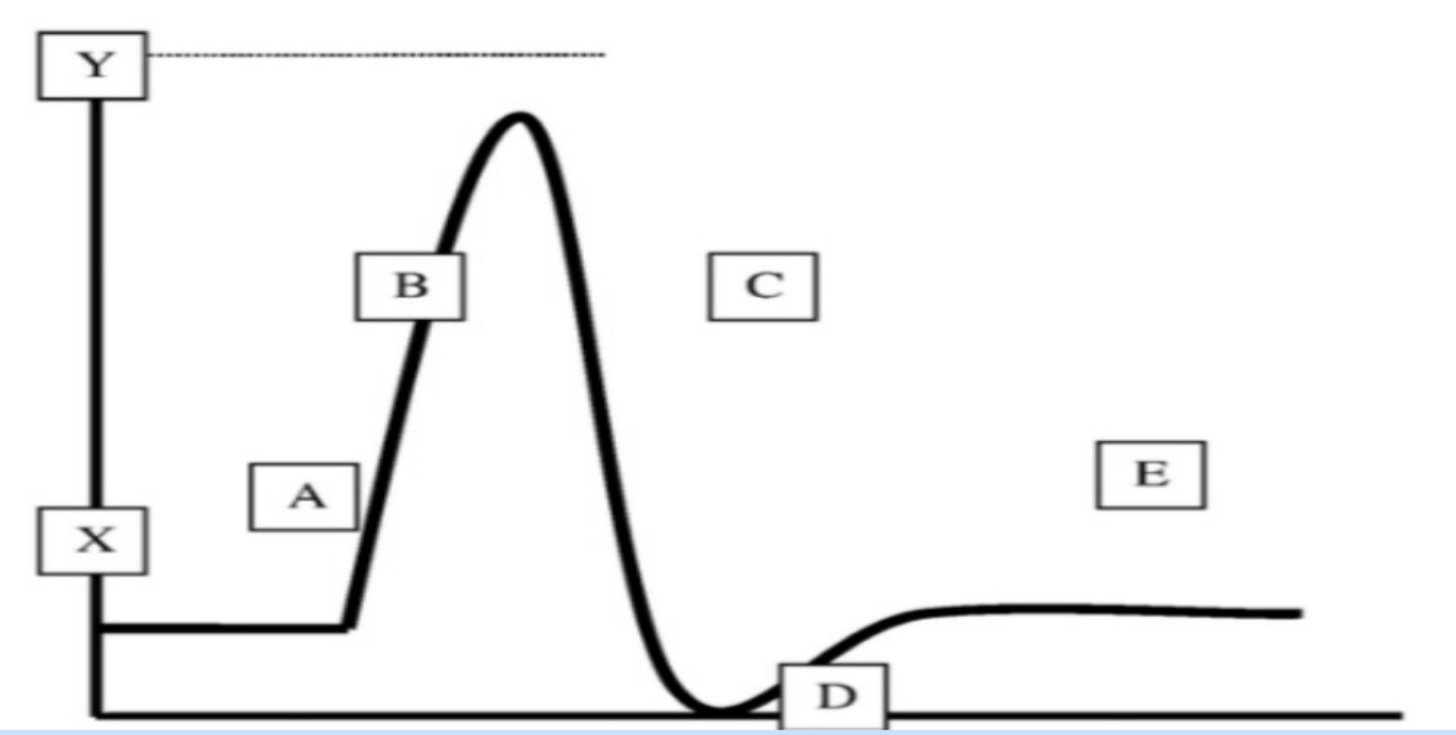

The graph above shows the voltage changes which occur across a nerve cell membrane during an action potential. The following questions refer to each of the points A to E indicated above

1. Which point corresponds to membrane hyperpolarisation?
2. At which points is the membrane at rest?
3. Which point corresponds to membrane repolarisation?
4. Which point corresponds to membrane depolarisation?
5. At which point are the sodium gates fully open?

Answers : D, A and E ,C, B and B

Intensity of the stimulus (mV)	Action of the neuron
10	no action potential
20	action potential
30	action potential
40	action potential

InTable1, the scientists noted that in each test that produced an action potential, the membrane charge reached(40 mv) during the action porential. which.of the following facts does this demonstrate?
(a) Thethreshold potential isaomv
(b) Any thing above threshold produces an all-or none responser
(C) Depolarization is.dependent on the strength.of the stimulus.
Answer:B

Resting Membrane Potential is the difference across plasma membranes expressed in millivolts

Select one of the following:

True ✓

False

Resting Membrane Potential is determined by..

Select one of the following:

- Permeability to K+ and Ca+
- Permeability to Na+ and K+ ✓
- Permeability to Na+ and Ca+

When k+ concentration inside the cell is high, the electrical gradient will force K+ into the cell because the electrical gradient is stronger than the chemical gradient.

Select one of the following:

- True
- False ✓

When Na+ concentration inside the cell is low, the cell will

Select one or more of the following:

- Move Na+ out of the cell because of the electrical gradient
- Move Na+ into the cell because of the electrical gradient ✓
- Move Na+ into the cell because of the chemical gradient ✓
- Move Na+ out of the cell to reach an equilibrium

An Action Potential occurs when a threshold point of -40mV is reached

Select one of the following:

- True
- False ✓

During the repolarisation phase of an action potential..

Select one or more of the following:

- Na+ voltage gates open
- K+ gates open at -90mV(ICF) ✓
- K+ gates opening, allowing K+ to flow out the cell ✓
- K+ gates close at -90mV (ICF) ✓
- Na+ voltage gates close at -30mV (ICF)

The electrical signal (action potential) is sent along the axon of a nerve cell

Select one of the following:

- True ✓
- False

What happens to the electrical signal (action potential) when it enters the axon terminal?

Select one or more of the following:

- Causes an influx of Ca+ ✓
- It continues as an electrical gradient
- It enters the synaptic cleft as neurotransmitters ✓
- it stays in the axon terminal
- It changes to a chemical signal ✓

1. What maintains the resting membrane potential close to the equilibrium potential of potassium (EK+)?
   A) Leakage of Na+
   B) Leakage of K+
   C) Activation of Na+ channels
   D) Activation of K+ channels
   Answer: B) Leakage of K+

2. What happens to K+ channels during depolarization?
   A) They close
   B) They open
   C) They become inactive
   D) They remain unchanged
   Answer: B) They open

3. How does the activation of voltage-gated K+ channels compare to Na+ channels?
   A) It is faster
   B) It is slower
   C) It is the same
   D) It depends on the cell type
   Answer: B) It is slower

4. What does the delayed activation of K+ channels result in?
   A) Rapid depolarization
   B) Delayed repolarization
   C) Delayed hyperpolarization
   D) Rapid hyperpolarization
   Answer: B) Delayed repolarization

5. What is the result of the combined delayed activation of K+ channels and inactivation of Na+ channels?
   A) Rapid depolarization
   B) Rapid repolarization
   C) Rapid hyperpolarization
   D) Rapid return to resting potential
   Answer: B) Rapid repolarization

6. What is the term for the phase in the action potential characterized by a rapid return of the membrane potential to its resting level?
   A) Rising phase
   B) Falling phase
   C) Overshoot phase

D) Afterpotential phase
Answer: B) Falling phase

7. During the afterpotential phase, the membrane potential may go to:
A) More positive potential than during resting potential
B) More negative potential than during resting potential
C) The same potential as during resting potential
D) Zero potential
Answer: B) More negative potential than during resting potential

8. What is the term for the more negative potential than resting potential during the afterpotential phase?
A) Positive afterpotential
B) Negative afterpotential
C) Hyperpolarization
D) Depolarization
Answer: A) Positive afterpotential

9. What causes the positive afterpotential?
A) Excess influx of K+
B) Excess efflux of K+
C) Excess influx of Na+
D) Excess efflux of Na+
Answer: B) Excess efflux of K+

10. What is the likely consequence of excess K+ efflux during the positive afterpotential?
A) Accumulation of positive ions inside the cell

B) Accumulation of negative ions inside the cell
C) Deficit of positive ions inside the cell
D) Deficit of negative ions inside the cell
Answer: C) Deficit of positive ions inside the cell

11. During resting state, what maintains the resting membrane potential close to EK+?
A) Leakage of Na+
B) Leakage of K+
C) Activation of Na+ channels
D) Activation of K+ channels
Answer: B) Leakage of K+

12. What occurs to K+ channels during depolarization?
A) They open
B) They close
C) They become inactive
D) They remain unchanged
Answer: A) They open

13. How does the activation of voltage-gated K+ channels compare to Na+ channels?
A) It is slower
B) It is faster
C) It is the same
D) It depends on the cell type
Answer: A) It is slower

14. What is the result of the delayed activation of K+ channels?

A) Rapid depolarization
B) Delayed repolarization
C) Delayed hyperpolarization
D) Rapid hyperpolarization
Answer: B) Delayed repolarization

15. What causes the falling phase in the action potential?
A) Rapid depolarization
B) Rapid repolarization
C) Rapid hyperpolarization
D) Rapid return to resting potential
Answer: B) Rapid repolarization

16. During the positive afterpotential, the membrane potential may become:
A) More positive than resting potential
B) More negative than resting potential
C) The same as resting potential
D) Zero
Answer: B) More negative than resting potential

17. What term describes the phase where the membrane potential goes to a more negative potential than during resting potential?
A) Positive afterpotential
B) Negative afterpotential
C) Hyperpolarization
D) Depolarization
Answer: C) Hyperpolarization

18. What is the likely cause of the positive afterpotential?
A) Excess influx of K+
B) Excess efflux of K+
C) Excess influx of Na+
D) Excess efflux of Na+
Answer: B) Excess efflux of K+

19. What is the probable consequence of excess K+ efflux during the positive afterpotential?
A) Accumulation of positive ions inside the cell
B) Accumulation of negative ions inside the cell
C) Deficit of positive ions inside the cell
D) Deficit of negative ions inside the cell
Answer: C) Deficit of positive ions inside the cell

20. What maintains the resting membrane potential close to the equilibrium potential of potassium (EK+) during resting state?
A) Leakage of Na+
B) Leakage of K+
C) Activation of Na+ channels
D) Activation of K+ channels
Answer: B) Leakage of K+

21. What is responsible for the rising phase of an action potential?
A) Slow K+ – Ca++ channels
B) Fast activation of Na+ channels
C) Slow activation of K+ channels
D) Slow activation of Ca++ channels

Answer: B) Fast activation of Na+ channels

22. In which types of excitable cells are slow K+ – Ca++ channels commonly found?

A) Neuronal cells
B) Skeletal muscle cells
C) Cardiac muscle and uterine muscle cells
D) Liver cells
Answer: C) Cardiac muscle and uterine muscle cells

23. How do slow K+ – Ca++ channels compare to Na+ channels in terms of activation rate?

A) They are activated faster
B) They are activated at the same rate
C) They are activated slower
D) They are not involved in activation
Answer: C) They are activated slower

24. What is the main ion that enters the cell through slow K+ – Ca++ channels?

A) Na+
B) K+
C) Cl-
D) Ca++
Answer: D) Ca++

25. What does the prolonged opening of slow channels prevent?

A) Entry of Na+ ions
B) Rapid fall induced by activation of K+ channels

C) Depolarization of the membrane potential
D) Activation of fast Na+ channels
Answer: B) Rapid fall induced by activation of K+ channels

26. What is the term for the period during which the membrane potential is maintained for a while before falling to its resting level?
A) Rising phase
B) Falling phase
C) Plateau phase
D) Refractory period
Answer: C) Plateau phase

27. Why is the presence of a plateau phase important in certain cells?
A) It shortens the action potential duration
B) It prevents the cell from responding to stimuli
C) It prolongs the time of an action potential
D) It increases the refractory period
Answer: C) It prolongs the time of an action potential

28. Which type of cells remain longer in the refractory period due to the presence of a plateau phase?
A) Neuronal cells
B) Skeletal muscle cells
C) Cardiac muscle and uterine muscle cells
D) Liver cells
Answer: C) Cardiac muscle and uterine muscle cells

**29. What is the primary function of slow K+ – Ca++

channels in excitable cells?**

A) Rapid repolarization of the membrane potential
B) Maintaining the resting membrane potential
C) Preventing depolarization of the membrane potential
D) Prolonging the duration of the action potential
Answer: D) Prolonging the duration of the action potential

30. What ion primarily enters the cell through slow K+ – Ca++ channels, contributing to the plateau phase?

A) Na+
B) K+
C) Cl-
D) Ca++
Answer: D) Ca++

31. During which stage of the action potential does the cell become unresponsive to any stimulus, even if it is stronger?

A) Firing stage
B) Rising phase
C) Falling phase
D) Absolute refractory period
Answer: D) Absolute refractory period

32. How long does the absolute refractory period last during an action potential?

A) Until the end of the action potential
B) Until the end of the falling phase
C) Until the end of the rising phase
D) Until the end of the first third of the falling phase

Answer: D) Until the end of the first third of the falling phase

33. What happens to the cell's ability to respond to stimuli during the absolute refractory period?
A) It becomes more responsive
B) It becomes less responsive
C) It remains unchanged
D) It becomes completely unresponsive
Answer: D) It becomes completely unresponsive

34. Which of the following describes the absolute refractory period?
A) The cell can respond to a stronger stimulus than usual
B) The cell cannot respond to any stimulus, regardless of its strength
C) The cell responds only to specific types of stimuli
D) The cell responds more quickly than usual to a stimulus
Answer: B) The cell cannot respond to any stimulus, regardless of its strength

35. What is the significance of the absolute refractory period during an action potential?
A) It ensures the cell responds to all stimuli
B) It prevents the cell from responding to consecutive stimuli, allowing for proper regulation of signaling
C) It increases the cell's sensitivity to stimuli
D) It shortens the duration of the action potential
Answer: B) It prevents the cell from responding to consecutive stimuli, allowing for proper regulation of signaling

:

36. During which phase of the action potential does the relative refractory period occur?
A) Rising phase
B) Falling phase
C) Second phase
D) Resting phase
Answer: C) Second phase

37. What characterizes the relative refractory period of an action potential?
A) The cell can respond to any stimulus
B) The cell cannot respond to any stimulus
C) The cell can respond only to weaker stimuli
D) The cell can respond to stronger stimuli, but it requires a greater stimulus than usual
Answer: D) The cell can respond to stronger stimuli, but it requires a greater stimulus than usual

38. How does the membrane potential during the relative refractory period compare to the resting membrane potential?
A) It is higher
B) It is lower
C) It is the same
D) It fluctuates
Answer: B) It is lower

39. What is the main purpose of the relative refractory period?
A) To prevent the cell from responding to any stimulus

B) To provide a period of adaptation after the action potential

C) To increase the cell's sensitivity to stimuli

D) To shorten the duration of the action potential

Answer: B) To provide a period of adaptation after the action potential

40. Which type of stimulus can alter the membrane potential during the relative refractory period?

A) Weaker stimulus

B) Stronger stimulus

C) Any stimulus

D) Specific type of stimulus

Answer: B) Stronger stimulus

41. During which phase of the action potential does the relative refractory period occur?

A) Rising phase

B) Falling phase

C) Second phase

D) Resting phase

Answer: C) Second phase

42. What characterizes the relative refractory period of an action potential?

A) The cell can respond to any stimulus

B) The cell cannot respond to any stimulus

C) The cell can respond only to weaker stimuli

D) The cell can respond to stronger stimuli, but it requires a

greater stimulus than usual
Answer: D) The cell can respond to stronger stimuli, but it requires a greater stimulus than usual

43. How does the membrane potential during the relative refractory period compare to the resting membrane potential?
A) It is higher
B) It is lower
C) It is the same
D) It fluctuates
Answer: B) It is lower

44. What is the main purpose of the relative refractory period?
A) To prevent the cell from responding to any stimulus
B) To provide a period of adaptation after the action potential
C) To increase the cell's sensitivity to stimuli
D) To shorten the duration of the action potential
Answer: B) To provide a period of adaptation after the action potential

45. Which type of stimulus can alter the membrane potential during the relative refractory period?
A) Weaker stimulus
B) Stronger stimulus
C) Any stimulus
D) Specific type of stimulus
Answer: B) Stronger stimulus

46.Which term describes the cel membrane potential ofa neuron at rest?
A)Polarized
B)Depolarized
C)Hyperpolarized
D)Repolarized
Answer: A)polarized

47.How are potassum ions typrcally moved out of aneuron when the membrane is at rest?

A)Electrical gradients move potassium ion out of the cell.
B)The sodium-potassium pump moves potassium ions out ofthe cel
C)Potassium ions are stable and do not move

D)Concentration gradients move potassium ions out of the cell.
Answer:D

48).Action.potentials.are characterized by which.of the following?

A)Depolarization or hyperpolarization

B)Slightly negative polarization

C)Rapid depolarization
Answer:C

49) A typical neuron has a resting membrane potential of about:

(A) +70 mV (B) +70 V(C) −70 mV(D) −70V (E) All of the above are observed at rest

50)Which ion is found in a higher concentration outside a neuron than inside?
A)Sodium
B)Potassium
C)proteins
Answer:B

51)What causes depolarization of the neuron?

A)sodium going into neuron

B)sodium going out of neuron

C)potassium going into neuron

D)potassium going out of neuron
Answer:A

52.What is the main function of the sodium-potassium pump in a neuron?

A)To maintain the resting membrane potential

B)To initiate the action potential

C)To release neurotransmitters

D)To regulate the synaptic transmission

Answer:A

53- What are the units used to measure membrane potential?
A. Calories
B. Millivolts
C. Moles
D. Kelvin

Answer: B. Millivolts

54- What does the Nernst equation measure?
A. The electrochemical gradient
B. The plasma membrane
C. Ions
D. Membrane potential

Answer: D. Membrane potential

55- What are the two constants in the Nernst equation?
A. Faraday's constant and inside concentration
B. Universal gas constant and Faraday's constant
C. Moles and concentration
D. 2.3 ln and

Answer: A. Faraday's constant and inside concentration

56)One of the Causes of RMP is:
A. Selective permeability
B. inhibition ofSodium potasium pump.
C. equal distribufica ofions
D. Yolagegared Na- chamnels
Answer:A

57)The resting membrane potenial is caused by:
A,. Diffusion of K+ ions outside the nerve fbers.
B. Diffusion ofNa+ ionsinside thenerve fbers.
C. Opening ofthechemically acivatcdion channels.
D. Opening of thevoltageactivatedion channels

Answer:A

The resting membrane protentional in nerve mbersis:
(A)Normaly about-10mV
(B) Due to K+ diffusion from outside to inside the nerve fibers.
(C)Dueto difusion of intracellular protein to outside the nerve
fibers.
(D)A passivcprocess.
(E, None ofthe above.
Answer:E