

Question 1: What are the two functions that the proteins perform in the neuronal membrane to establish and maintain the resting membrane potential?

Answer: Proteins in the neuronal membrane:

- 1) Provide channels that control the movement of specific ions across the neuronal membrane and
- 2) Pump sodium and potassium ions across the membrane against their concentration gradient to maintain the resting membrane potential.

Question 2: On which side of the neuronal membrane are Na^+ ions more abundant?

Answer: The neuronal membrane potential depends on the ionic concentrations on either side of the membrane. K^+ is more concentrated on the inside of the neuronal membrane, whereas Na^+ and Ca^{2+} are more concentrated on the outside.

Question 3: When the membrane is at the potassium equilibrium potential, in which direction (in or out) is there a net movement of potassium ions?

Answer: The potassium equilibrium potential represents a balance between the chemical and electrical forces driving potassium across the membrane through potassium channels. There is no net movement of potassium ions at potassium's equilibrium potential, which is -80mV .

Question 4: There is a much greater potassium K^+ concentration inside the cell than outside.

Why, then, is the resting membrane potential negative?

Answer: The resting membrane potential is negative because the neuron is filled with negatively charged molecules, such as proteins, that do not traverse the cell membrane through channels the way ions do.

Question 5: When the brain is deprived of oxygen, the mitochondria within the neurons cease to produce ATP. What effect would this have on the membrane potential and why?

Answer: The neuronal membrane potential depends on different concentrations of sodium and potassium on either side of the membrane. Ionic concentration gradients are established by the action of the sodium-potassium ion pump, an enzyme that requires ATP. Without ATP, the pump will not function. As a result, the resting membrane potential will not exist and the brain will not function.