The Anatomy Of A Nerve Impulse Worksheet Questions and Answers PDF

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Part 1: Foundational Knowledge

What is the primary function of the myelin sheath in a neuron?

Hint: Think about the role of myelin in nerve impulse speed.

- ◯ A) To store neurotransmitters
- ◯ **B) To increase the speed of nerve impulse transmission ✓**
- ◯ C) To generate action potentials
- ◯ D) To maintain the resting potential

> The myelin sheath primarily increases the speed of nerve impulse transmission.

Which of the following are components of a neuron? (Select all that apply)

Hint: Consider the main parts that make up a neuron.

- ☐ **A) Dendrites ✓**
- ☐ **B) Axon ✓**
- ☐ C) Synapse
- ☐ **D) Cell body ✓**

> The components of a neuron include dendrites, axon, and cell body.

Explain the role of the sodium-potassium pump in maintaining the resting membrane potential of a neuron.

Hint: Consider how ions are moved across the membrane.

The sodium-potassium pump maintains the resting membrane potential by actively transporting sodium out of the neuron and potassium into the neuron.

List the three main phases of an action potential.

Hint: Think about the sequence of events during an action potential.

1. Phase 1

Depolarization

2. Phase 2

Repolarization

3. Phase 3

Hyperpolarization

The three main phases of an action potential are depolarization, repolarization, and hyperpolarization.

Part 2: Understanding and Interpretation

During which phase of the action potential do sodium ions rush into the neuron?

Hint: Consider the phase where the membrane potential becomes more positive.

- ◯ A) Restoring potential
- ◯ **B) Depolarization ✓**
- ◯ C) Repolarization
- ◯ D) Hyperpolarization

> Sodium ions rush into the neuron during the depolarization phase.

Which statements are true about the refractory period? (Select all that apply)

Hint: Think about the characteristics of the refractory period.

- ☐ **A) It prevents the backward propagation of action potentials. ✓**
- ☐ **B) It occurs after the action potential has reached its peak. ✓**
- ☐ C) It allows the neuron to immediately fire another action potential.
- ☐ **D) It is divided into absolute and relative periods. ✓**

> The refractory period prevents backward propagation of action potentials and is divided into absolute and relative periods.

Describe how neurotransmitters facilitate synaptic transmission between neurons.

Hint: Consider the process of neurotransmitter release and binding.

> **Neurotransmitters facilitate synaptic transmission by being released from the presynaptic neuron and binding to receptors on the postsynaptic neuron, leading to a response.**

Part 3: Applying Knowledge and Analyzing Relationships

If a neuron is exposed to a toxin that blocks sodium channels, what immediate effect would this have on action potential generation?

Hint: Think about the role of sodium channels in action potentials.

- ◯ A) Action potentials would be generated more frequently.
- ◯ **B) Action potentials would not be generated. ✓**
- ◯ C) The resting potential would become more positive.
- ◯ D) The neuron would become hyperpolarized.

> If sodium channels are blocked, action potentials would not be generated.

In a scenario where the myelin sheath is damaged, what consequences might occur? (Select all that apply)

Hint: Consider the effects of myelin damage on nerve function.

- ☐ **A) Slower nerve impulse transmission ✓**
- ☐ B) Increased action potential frequency
- ☐ **C) Impaired coordination and movement ✓**
- ☐ D) Enhanced synaptic transmission

> Damaged myelin sheath can lead to slower nerve impulse transmission, impaired coordination, and movement.

Apply your understanding of synaptic transmission to explain how a drug that inhibits neurotransmitter reuptake might affect neural communication.

Hint: Consider the role of reuptake in neurotransmitter availability.

> **A drug that inhibits neurotransmitter reuptake would increase the availability of neurotransmitters in the synaptic cleft, enhancing neural communication.**

Part 4: Synthesis and Reflection

Which of the following best explains why action potentials are unidirectional?

Hint: Think about the factors that influence the direction of action potentials.

- ◯ A) The presence of the myelin sheath
- ◯ **B) The refractory period following an action potential ✓**
- ◯ C) The structure of the axon
- ◯ D) The release of neurotransmitters

> Action potentials are unidirectional due to the refractory period following an action potential.

Analyze the effects of hyperpolarization on a neuron. Which statements are correct? (Select all that apply)

Hint: Consider how hyperpolarization affects neuronal excitability.

- ☐ **A) It makes the neuron less likely to fire an action potential. ✓**
- ☐ **B) It occurs when potassium channels remain open longer than necessary. ✓**
- ☐ C) It results in a more positive membrane potential.
- ☐ D) It is a phase that immediately follows depolarization.

> Hyperpolarization makes the neuron less likely to fire an action potential and occurs when potassium channels remain open longer than necessary.

Which strategy would be most effective in treating a neurological disorder characterized by excessive neuronal firing?

Hint: Consider the mechanisms that could reduce neuronal excitability.

- ◯ A) Enhancing sodium channel activity
- ◯ B) Inhibiting potassium channel activity
- ◯ C) Increasing neurotransmitter release
- ◯ **D) Enhancing the function of inhibitory neurotransmitters ✓**

> Enhancing the function of inhibitory neurotransmitters would be the most effective strategy.

Evaluate the potential effects of a novel drug that enhances the reuptake of neurotransmitters. Which outcomes are likely? (Select all that apply)

Hint: Think about how reuptake affects neurotransmitter levels in the synapse.

- ☐ **A) Decreased synaptic transmission ✓**
- ☐ B) Increased neurotransmitter availability in the synaptic cleft
- ☐ **C) Reduced neuronal excitability ✓**
- ☐ D) Enhanced synaptic plasticity

> A drug that enhances reuptake would likely decrease synaptic transmission and reduce neuronal excitability.

Design an experiment to test the effects of a new drug on action potential propagation in neurons. Outline the hypothesis, method, and expected results.

Hint: Consider how you would structure an experiment to measure action potentials.

> **The experiment would involve hypothesizing that the drug enhances action potential propagation, using electrophysiological techniques to measure changes in action potential characteristics.**