Anatomy & A&P 12 Nervous System Essay

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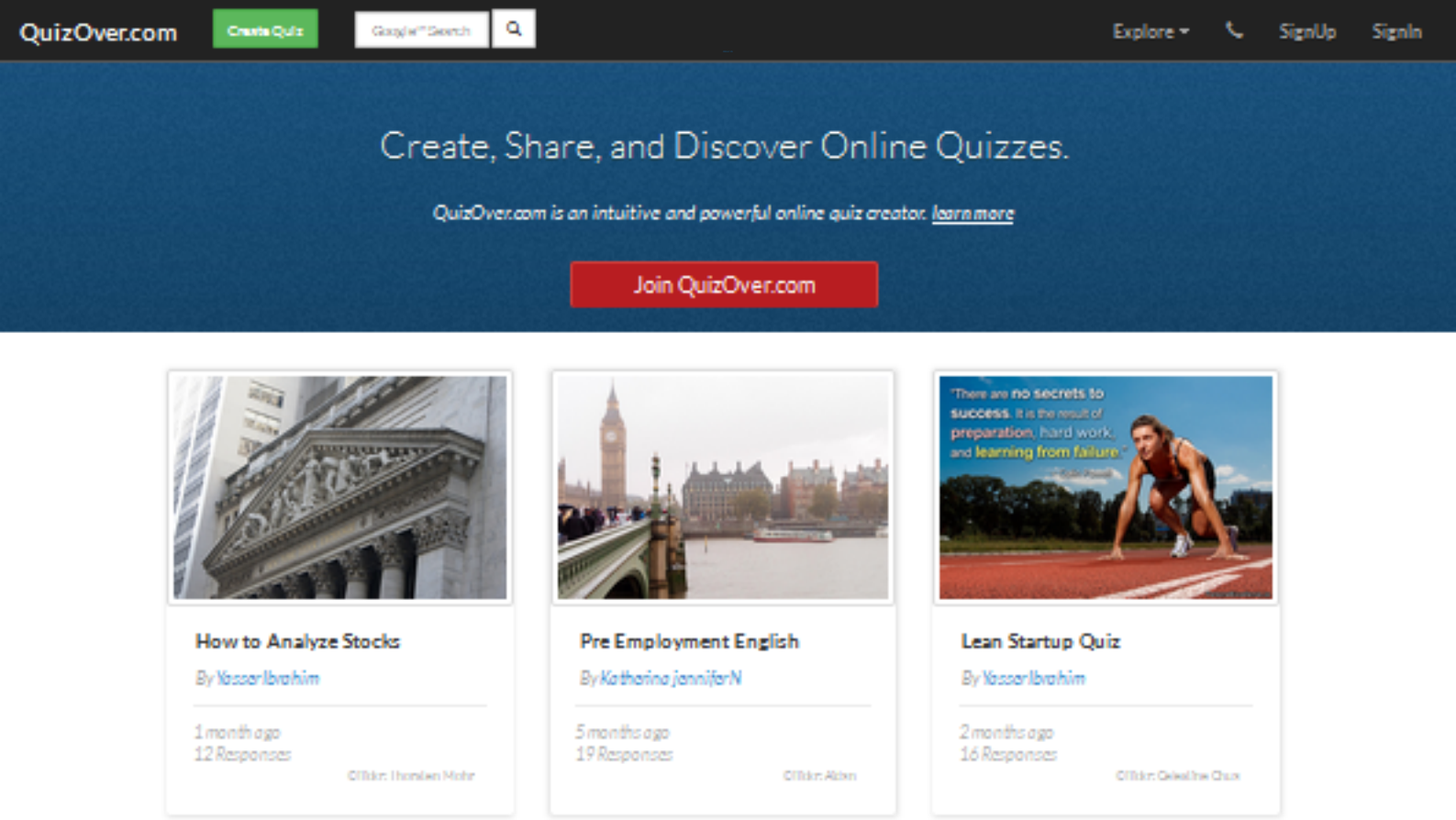

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4. Chapter: A&P 12 Nervous System Essay

1. A&P 12 Nervous System Essay Questions

4.1.1. In 2003, the Nobel Prize in Physiology or Medicine was awarded to P...

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In 2003, the Nobel Prize in Physiology or Medicine was awarded to Paul C. Lauterbur and Sir Peter Mansfield for discoveries related to magnetic resonance imaging (MRI).

This is a tool to see the structures of the body (not just the nervous system) that depends on magnetic fields associated with certain atomic nuclei.

The utility of this technique in the nervous system is that fat tissue and water appear as different shades between black and white.

Because white matter is fatty (from myelin) and gray matter is not, they can be easily distinguished in MRI images.

Visit the Nobel Prize website (http://openstaxcollege.org/l/nobel_2) to play an interactive game that demonstrates the use of this technology and compares it with other types of imaging technologies.

Also, the results from an MRI session are compared with images obtained from x-ray or computed tomography.

How do the imaging techniques shown in this game indicate the separation of white and gray matter compared with the freshly dissected tissue shown earlier?

- MRI uses the relative amount of water in tissue to distinguish different areas, so gray and white matter in the nervous system can be seen clearly in these images.

4.1.2. Visit this site (http://openstaxcollege.org/l/troublewstairs) to re...

Author: OpenStax College

Visit this site (http://openstaxcollege.org/l/troublewstairs) to read about a woman that notices that her daughter is having trouble walking up the stairs.

This leads to the discovery of a hereditary condition that affects the brain and spinal cord.

The electromyography and MRI tests indicated deficiencies in the spinal cord and cerebellum, both of which are responsible for controlling coordinated movements.

To what functional division of the nervous system would these structures belong?

- They are part of the somatic nervous system, which is responsible for voluntary movements such as walking or climbing the stairs.

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Question: Visit this site http://openstaxcollege OpenStax College Anatomy Quest

4.1.3. Visit this site (http://openstaxcollege.org/l/nervetissue3) to lear...

Author: OpenStax College

Visit this site (http://openstaxcollege.org/l/nervetissue3) to learn about how nervous tissue is composed of neurons and glial cells.

The neurons are dynamic cells with the ability to make a vast number of connections and to respond incredibly quickly to stimuli and to initiate movements based on those stimuli.

They are the focus of intense research as failures in physiology can lead to devastating illnesses. Why are neurons only found in animals?

Based on what this article says about neuron function, why wouldn't they be helpful for plants or microorganisms?

- Neurons enable thought, perception, and movement. Plants do not move, so they do not need this type of tissue.
  Microorganisms are too small to have a nervous system. Many are single-celled, and therefore have organelles for perception and movement.

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4.1.4. View the University of Michigan WebScope at: http://virtualslides.m...

Author: OpenStax College

View the University of Michigan WebScope at:

http://virtualslides.med.umich.edu/Histology/EMsmallCharts/3%20Image%20Scope%20finals/054%20-%20Peripheral%20nerve_001.svs/view.apml?listview=1&

(http://openstaxcollege.org/l/nervefiber)

to see an electron micrograph of a cross-section of a myelinated nerve fiber.

The axon contains microtubules and neurofilaments, bounded by a plasma membrane known as the axolemma.

Outside the plasma membrane of the axon is the myelin sheath, which is composed of the tightly wrapped plasma membrane of a Schwann cell.

What aspects of the cells in this image react with the stain that makes them the deep, dark, black color, such as the multiple layers that are the myelin sheath?

- Lipid membranes, such as the cell membrane and organelle membranes.

Check the answer of this question online at QuizOver.com:
Question: View the University of Michigan WebScope OpenStax College Anatomy

4.1.5. What happens across the membrane of an electrically active cell is ...

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What happens across the membrane of an electrically active cell is a dynamic process that is hard to visualize with static images or through text descriptions.

View this animation (http://openstaxcollege.org/l/dynamic1) to really understand the process.

What is the difference between the driving force for Na+ and K+? And what is similar about the movement of these two ions?

- Sodium is moving into the cell because of the immense concentration gradient, whereas potassium is moving out because of the depolarization that sodium causes. However, they both move down their respective gradients, toward equilibrium.

Check the answer of this question online at QuizOver.com:
Question: What happens across the membrane of an OpenStax College Anatomy Quest

4.1.6. Visit this site (http://openstaxcollege.org/l/neurolab) to see a vi...

Author: OpenStax College

Visit this site (http://openstaxcollege.org/l/neurolab) to see a virtual neurophysiology lab, and to observe electrophysiological processes in the nervous system, where scientists directly measure the electrical signals produced by neurons.

Often, the action potentials occur so rapidly that watching a screen to see them occur is not helpful.

A speaker is powered by the signals recorded from a neuron and it "pops" each time the neuron fires an action potential.

These action potentials are firing so fast that it sounds like static on the radio.

Electrophysiologists can recognize the patterns within that static to understand what is happening.

Why is the leech model used for measuring the electrical activity of neurons instead of using humans?

- The properties of electrophysiology are common to all animals, so using the leech is an easier, more humane approach to studying the properties of these cells.
  There are differences between the nervous systems of invertebrates (such as a leech) and vertebrates, but not for the sake of what these experiments study.

Check the answer of this question online at QuizOver.com:
Question: Visit this site http://openstaxcollege OpenStax College Anatomy Quest

4.1.7. Watch this video (http://openstaxcollege.org/l/summation) to learn ...

Author: OpenStax College

Watch this video (http://openstaxcollege.org/l/summation) to learn about summation.

The process of converting electrical signals to chemical signals and back requires subtle changes that can result in transient increases or decreases in membrane voltage.

To cause a lasting change in the target cell, multiple signals are usually added together, or summated.

Does spatial summation have to happen all at once, or can the separate signals arrive on the postsynaptic neuron at slightly different times? Explain your answer.

- A second signal from a separate presynaptic neuron can arrive slightly later, as long as it arrives before the first one dies off, or dissipates.

Check the answer of this question online at QuizOver.com:
Question: Watch this video http://openstaxcollege OpenStax College Anatomy

4.1.8. Watch this video (http://openstaxcollege.org/l/neurotrans) to learn...

Author: OpenStax College

Watch this video (http://openstaxcollege.org/l/neurotrans) to learn about the release of a neurotransmitter.

The action potential reaches the end of the axon, called the axon terminal, and a chemical signal is released to tell the target cell to do something, either initiate a new action potential, or to suppress that activity.

In a very short space, the electrical signal of the action potential is changed into the chemical signal of a neurotransmitter, and then back to electrical changes in the target cell membrane.

What is the importance of voltage-gated calcium channels in the release of neurotransmitters?

- The action potential depolarizes the cell membrane of the axon terminal, which contains the voltage-gated Ca2+ channel.
  That voltage change opens the channel so that Ca2+ can enter the axon terminal.
  Calcium ions make it possible for synaptic vesicles to release their contents through exocytosis.

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Question: Watch this video http://openstaxcollege OpenStax College Anatomy

4.1.9. What responses are generated by the nervous system when you run on ...

Author: OpenStax College

What responses are generated by the nervous system when you run on a treadmill? Include an example of each type of tissue that is under nervous system control.

- Running on a treadmill involves contraction of the skeletal muscles in the legs, increase in contraction of the cardiac muscle of the heart, and the production and secretion of sweat in the skin to stay cool.

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Question: What responses are generated by the nervous OpenStax College Anatomy

4.1.10. When eating food, what anatomical and functional divisions of the n...

Author: OpenStax College

When eating food, what anatomical and functional divisions of the nervous system are involved in the perceptual experience?

- The sensation of taste associated with eating is sensed by nerves in the periphery that are involved in sensory and somatic functions.

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Question: When eating food what anatomical and OpenStax College Anatomy Quest

4.1.11. Multiple sclerosis is a demyelinating disease affecting the central...

Author: OpenStax College

Multiple sclerosis is a demyelinating disease affecting the central nervous system.

What type of cell would be the most likely target of this disease? Why?

- The disease would target oligodendrocytes. In the CNS, oligodendrocytes provide the myelin for axons.

Check the answer of this question online at QuizOver.com:
Question: Multiple sclerosis is a demyelinating OpenStax College Anatomy Quest

4.1.12. Which type of neuron, based on its shape, is best suited for relayi...

Author: OpenStax College

Which type of neuron, based on its shape, is best suited for relaying information directly from one neuron to another? Explain why.

- Bipolar cells, because they have one dendrite that receives input and one axon that provides output, would be a direct relay between two other cells.

4.1.13. Sensory fibers, or pathways, are referred to as "afferent." Motor f...

Author: OpenStax College

Sensory fibers, or pathways, are referred to as "afferent." Motor fibers, or pathways, are referred to as "efferent."

What can you infer about the meaning of these two terms (afferent and efferent) in a structural or anatomical context?

- Afferent means "toward," as in sensory information traveling from the periphery into the CNS.
  Efferent means "away from," as in motor commands that travel from the brain down the spinal cord and out into the periphery.

Check the answer of this question online at QuizOver.com:
Question: Sensory fibers or pathways are referred OpenStax College Anatomy

4.1.14. If a person has a motor disorder and cannot move their arm voluntar...

Author: OpenStax College

If a person has a motor disorder and cannot move their arm voluntarily, but their muscles have tone, which motor neuron-upper or lower-is probably affected? Explain why.

- The upper motor neuron would be affected because it is carrying the command from the brain down.

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Question: If a person has a motor disorder and cannot OpenStax College Anatomy

4.1.15. What does it mean for an action potential to be an "all or none" ev...

Author: OpenStax College

What does it mean for an action potential to be an "all or none" event?

- The cell membrane must reach threshold before voltage-gated Na+ channels open.
  If threshold is not reached, those channels do not open, and the depolarizing phase of the action potential does not occur, the cell membrane will just go back to its resting state.

Check the answer of this question online at QuizOver.com:
Question: What does it mean for an action potential OpenStax College Anatomy

4.1.16. The conscious perception of pain is often delayed because of the ti...

Author: OpenStax College

The conscious perception of pain is often delayed because of the time it takes for the sensations to reach the cerebral cortex.

Why would this be the case based on propagation of the axon potential?

- Axons of pain sensing sensory neurons are thin and unmyelinated so that it takes longer for that sensation to reach the brain than other sensations.

Check the answer of this question online at QuizOver.com:
Question: The conscious perception of pain is often OpenStax College Anatomy

4.1.17. If a postsynaptic cell has synapses from five different cells, and ...

Author: OpenStax College

If a postsynaptic cell has synapses from five different cells, and three cause EPSPs and two of them cause IPSPs, give an example of a series of depolarizations and hyperpolarizations that would result in the neuron reaching threshold.

- EPSP1 = +5 mV, EPSP2 = +7 mV, EPSP 3 = +10 mV, IPSP1 = -4 mV, IPSP2 = -3 mV. 5 + 7 + 10 - 4 - 3 = +15 mV.

Check the answer of this question online at QuizOver.com:
Question: If a postsynaptic cell has synapses from OpenStax College Anatomy

4.1.18. Why is the receptor the important element determining the effect a ...

Author: OpenStax College

Why is the receptor the important element determining the effect a neurotransmitter has on a target cell?

- Different neurotransmitters have different receptors. Thus, the type of receptor in the postsynaptic cell is what determines which ion channels open.
  Acetylcholine binding to the nicotinic receptor causes cations to cross the membrane. GABA binding to its receptor causes the anion chloride to cross the membrane.

Check the answer of this question online at QuizOver.com:
Question: Why is the receptor the important element OpenStax College Anatomy