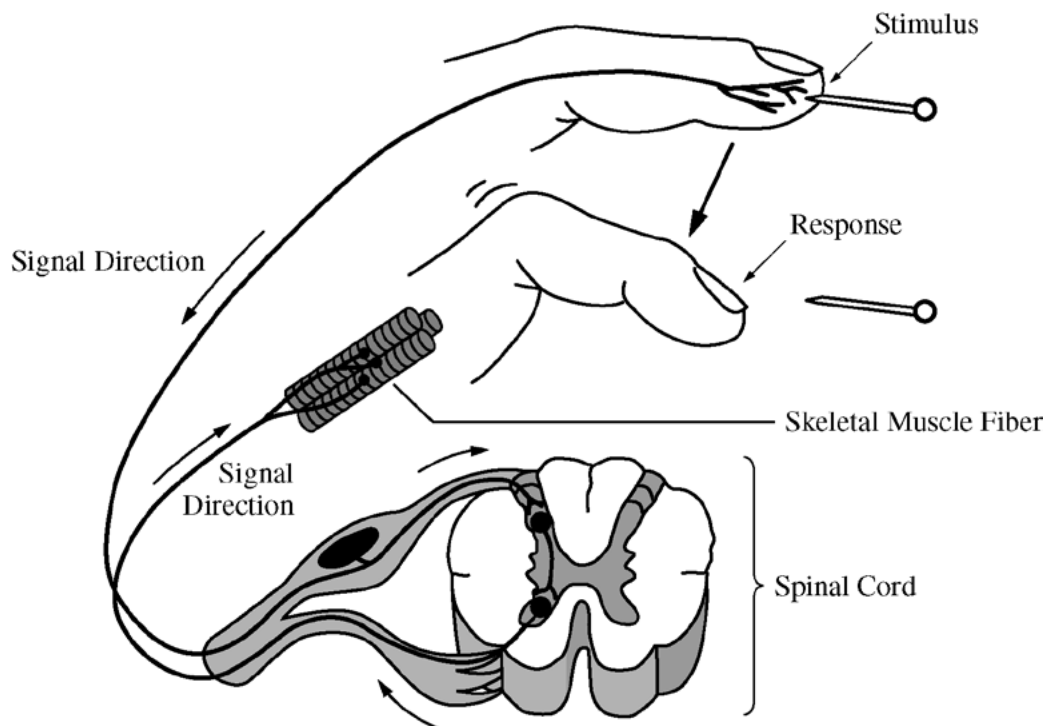


AP[®] BIOLOGY
2014 SCORING GUIDELINES

Question 6



Cross Section of Spinal Cord and Skeletal Muscle Fiber

Information processing involves complex neural pathways that require a certain amount of time between recognition of a stimulus and the resulting response. For some types of stimuli, a reflex arc replaces the typical stimulus-response pathway. A representation of a reflex arc is shown in the figure above.

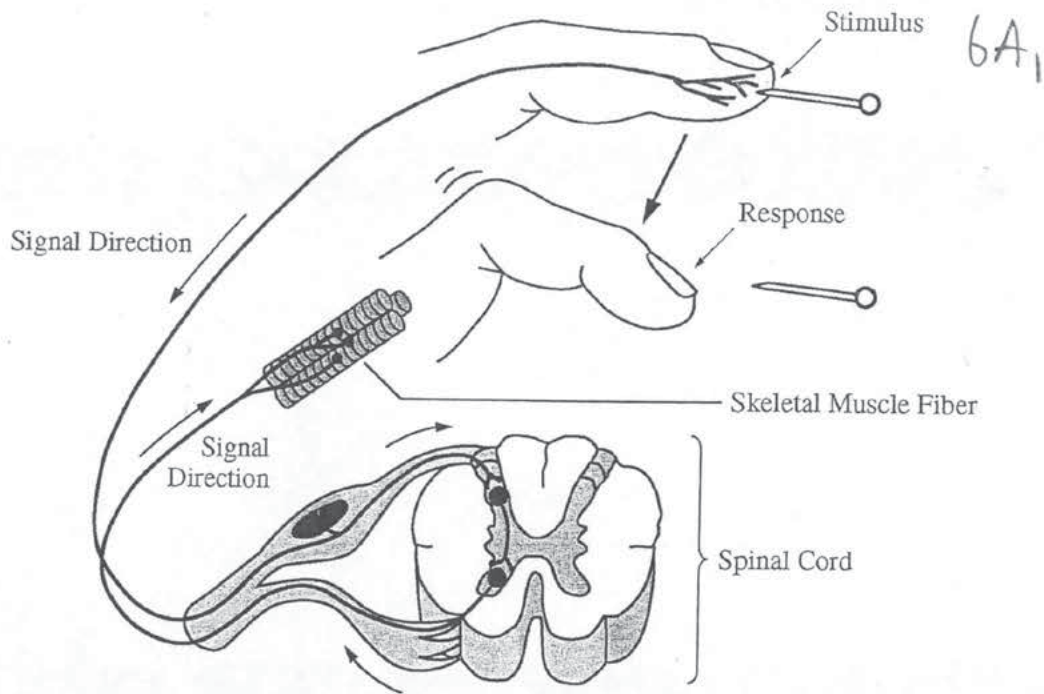
Based on the figure, **describe** TWO ways that the reflex arc differs from typical stimulus-response transmission pathways. **Provide** reasoning to support the claim that reflex arcs help organisms avoid serious injury. (3 points maximum; LO 2.38, 3.44, 3.45, 4.10)

Description of difference (1 point each; 2 points maximum)

- Quicker response time
- No integration with brain / does not reach brain before response occurs
- Fewer neurons / synapses involved in reflex arc / shorter distance for signal to travel
- Involuntary / no conscious control / no processing by brain

Reasoning to support claim (1 point maximum)

- Quicker response to a threat
- Response is innate (automatic response) rather than learned / predetermined neuron pathway / hardwired



Cross Section of Spinal Cord and Skeletal Muscle Fiber

6. Information processing involves complex neural pathways that require a certain amount of time between recognition of a stimulus and the resulting response. For some types of stimuli, a reflex arc replaces the typical stimulus-response pathway. A representation of a reflex arc is shown in the figure above.

Based on the figure, **describe** TWO ways that the reflex arc differs from typical stimulus-response transmission pathways. **Provide** reasoning to support the claim that reflex arcs help organisms avoid serious injury.

PAGE FOR ANSWERING QUESTION 6

Reflex arcs do not require as much time between recognition of a stimulus and the resulting ~~response~~ response. Reflex arcs also only require signals to travel to the spinal cord and not all the way to the brain like in a typical stimulus-response transmission. Reflex arcs help organisms avoid serious injury because it takes less time for them to react to the danger, and the faster reflex could prevent them from cutting

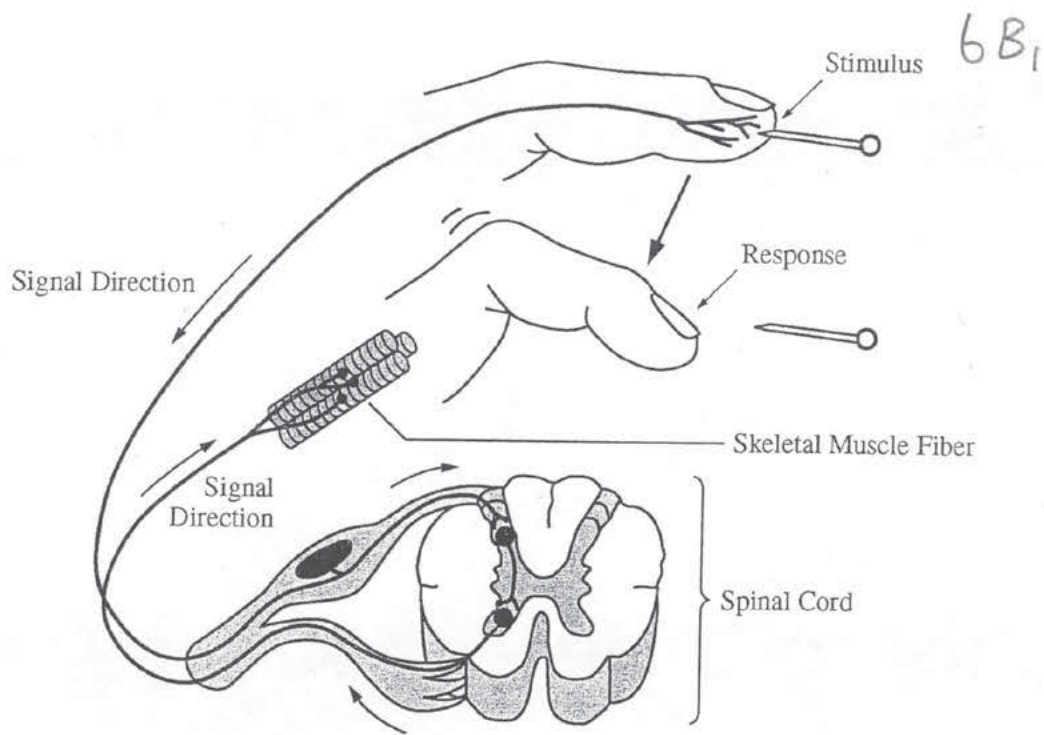
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6A₂

, or burning themselves. It takes less time to alert their body that they are in pain, so they are quicker to react so they are no longer feeling that pain.

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Cross Section of Spinal Cord and Skeletal Muscle Fiber

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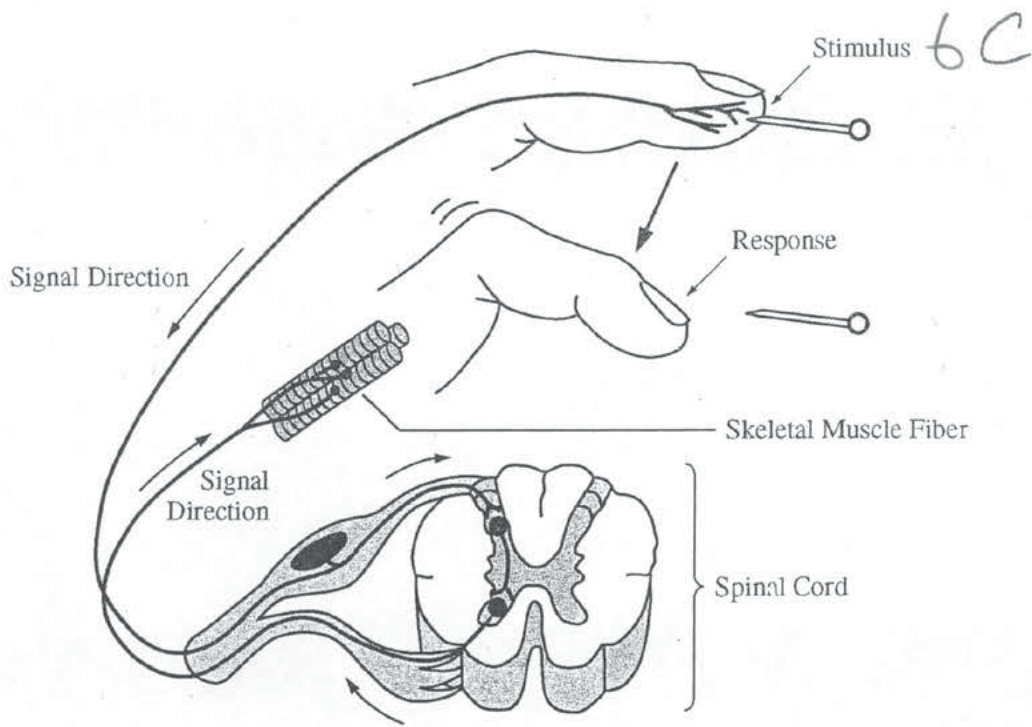
Based on the figure, **describe** TWO ways that the reflex arc differs from typical stimulus-response transmission pathways. **Provide** reasoning to support the claim that reflex arcs help organisms avoid serious injury.

PAGE FOR ANSWERING QUESTION 6

~~THE~~ TWO ways that the reflex arc differs from typical stimulus-response transmission pathways are it helps organisms avoid serious injury and allows a faster time between the recognition of a stimulus and resulting response. The reflex arc helps an organism avoid serious injury because of the time it takes for the stimulus to result in a response.

In the diagram it shows a hand being pricked by a ~~needle~~^{needle}. The ~~arc~~^{reflex} arc allows the time of the stimulus to cause a response faster so the finger to move away from the needle. However, if there was no reflex arc, the finger will be left to be pricked and damage the cells of the finger because it took more time for the stimulus to respond with out a reflex arc.

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Based on the figure, describe TWO ways that the reflex arc differs from typical stimulus-response transmission pathways. Provide reasoning to support the claim that reflex arcs help organisms avoid serious injury.

PAGE FOR ANSWERING QUESTION 6

One way that the reflex arc differs is that the signal is not sent to the brain. Another way is that it is sent in a ~~trap~~ straight line or an arc.

stimulus response

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2014 SCORING COMMENTARY

Question 6

Question 6 was written to the following Learning Objectives in the AP Biology Curriculum Framework: 2.38, 3.44, 3.45, 4.10.

Overview

Question 6 focuses on the response of the nervous system due to interactions between its constituent parts. Students were presented with a visual representation of a reflex arc and a brief description of neural pathways and asked to differentiate among pathways of information transmission within the nervous system. Students were then asked to describe differences between a reflex arc and a typical stimulus-response pathway, based on their analysis of the representation. Students were then asked to support the claim that reflex arcs are beneficial to organismal survival.

Sample: 6A

Score: 3

The response in Sample 6A earned 1 point for describing that a reflex arc does not require as much time between recognition of a stimulus and the resulting response. The response earned 1 point for describing that the impulses of a reflex arc do not travel to the brain. The response earned 1 point for reasoning that reflex arcs allow a faster reaction to danger thereby avoiding harm.

Sample: 6B

Score: 2

The response in Sample 6B earned 1 point for describing that a reflex arc does not require as much time between recognition of a stimulus and the resulting response. The response earned 1 point for reasoning that the reflex arc helps organisms avoid serious injury by allowing a faster response to a threat (“the needle”).

Sample: 6C

Score: 1

The response in Sample 6C earned 1 point for describing that the reflex arc signal does not reach the brain.