What is a Reflex Arc?

Worksheet

A reflex arc is the neural circuit - receptor, sensory neuron, integration center, motor neuron, and effector - that carries a stimulus to an automatic, involuntary response.

Questions

1. Which component of the reflex arc detects the stimulus?

A) Motor neuron
B) Receptor
C) Effector
D) Integration center

2. What distinguishes a monosynaptic reflex from a polysynaptic one?

A) Number of receptors involved
B) Presence or absence of an interneuron
C) Speed of the effector
D) Type of muscle involved

3. Where is the integration center for the knee-jerk reflex located?

A) Cerebral cortex
B) Cerebellum
C) Spinal cord
D) Hypothalamus

4. Which best explains why reflexes protect the body faster than conscious reactions?

A) They use larger muscles
B) They skip the brain's conscious processing
C) They only occur in the legs
D) They require repeated practice

5. Trace the pathway of the patellar (knee-jerk) reflex when a doctor taps the patellar tendon.

6. Trace the pathway of touching a hot stove and pulling your hand away.

7. Trace the pupillary light reflex when a bright light shines into the eye.

8. Define: What are the 5 components of a reflex arc?

9. Define: What is the difference between monosynaptic and polysynaptic reflexes?

10. Define: Why are reflexes faster than voluntary movements?

Answer Key

1. B) Receptor - The receptor is the first component; it senses the stimulus and starts the reflex.

2. B) Presence or absence of an interneuron - Monosynaptic reflexes have a direct sensory-to-motor synapse; polysynaptic reflexes route through one or more interneurons.

3. C) Spinal cord - Spinal reflexes like the patellar reflex are integrated in the spinal cord, not the brain.

4. B) They skip the brain's conscious processing - Reflex signals are processed locally at the spinal cord, avoiding the delay of sending signals to and from the brain.

5. Receptor: stretch receptor (muscle spindle) in the quadriceps detects sudden stretch Sensory neuron: carries signal directly to the spinal cord (L2-L4) Integration center: single synapse in the spinal cord (monosynaptic - no interneuron) Motor neuron: signal returns directly to the quadriceps Effector: quadriceps contracts, leg kicks forward

6. Receptor: thermoreceptors/nociceptors in the skin detect heat/pain Sensory neuron: signal travels to the spinal cord Integration center: interneuron in the spinal cord relays the signal (polysynaptic) Motor neuron: signal travels to the arm flexor muscles Effector: biceps contracts, hand withdraws - all before pain is consciously felt

7. Receptor: photoreceptors in the retina detect the increase in light Sensory neuron: optic nerve (CN II) carries the signal to the midbrain Integration center: pretectal nucleus in the midbrain processes the signal Motor neuron: oculomotor nerve (CN III) parasympathetic fibers carry the response Effector: pupillary sphincter muscle contracts, pupil constricts

8. Receptor, sensory neuron, integration center, motor neuron, effector.

9. Monosynaptic has one synapse and no interneuron (e.g., knee-jerk); polysynaptic includes one or more interneurons (e.g., withdrawal reflex).

10. The signal is processed at the spinal cord/brainstem, bypassing the slower round-trip to the conscious brain.