Reflex Action and Reflex Arc

**Learning Outcomes:**

1. Describe the path and process of a reflex action
2. Explain the functions of various components of the reflex arc

**Detailed description of the topic:**

1. When a person unknowingly touches a hot object, he immediately withdraws his hand. This kind of action is known as a reflex action.
2. A reflex action is a spontaneous, automatic and mechanical response controlled by the spinal cord. Interestingly, the brain is not involved in the occurrence of a reflex action. A reflex action occurs due to the sensory nerve and the motor nerve. They work together to produce a reflex action and the pathway followed by these nerves is called a reflex arc.
3. A reflex arc comprises the receptor or sensory organ, the sensory or afferent nerve, the relay or internuncial neurons of the spinal cord, and the motor or efferent nerve. Let’s understand how these components work in coordination to produce a reflex action. When this hot kettle is touched, the skin senses the heat and acts like a receptor.
4. The skin is the sensory organ which receives the stimulus, which is the heat in this case. The stimulus generates an impulse that is carried by the sensory nerve, also known as the afferent nerve. Once carried, the impulse travels through the spinal nerves, along the dorsal root, and ultimately reaches the spinal cord. In the spinal cord, the impulse passes to the relay or internunical neuron, which transmits the impulse to the motor nerve.
5. The motor nerve takes the impulse away from the spinal cord, along the ventral root. Fine, branch-like endings of the motor nerve connect it to the effector organ and produce a response. As when touching the hot kettle, the response is to immediately remove the hand.

**Summary:**

* A reflex action is a spontaneous, automatic and mechanical response controlled by the spinal cord.
* A reflex arc comprises the receptor or sensory organ, the sensory or afferent nerve, the relay or

internuncial neurons of the spinal cord and the motor or efferent nerve.

# Keywords

Nerve: One or more bundles of fibres forming a part of a system that conveys impulses of sensation, motion, etc., between the brain or spinal cord and the other parts of the body

Neuron: One of the cells that constitute the nervous tissue, that have the property of transmitting and receiving nervous impulses

Sensory organ: A bodily structure that receives a stimulus and is affected in such a manner so as to initiate excitation of associated sensory nerve fibres which convey specific impulses to the central nervous system where they are interpreted as corresponding sensations

Spinal cord: The cord of nervous tissue that extends lengthwise from the brain along the back in the vertebral canal, gives off pairs of spinal nerves, carries impulses to and from the brain, and serves as a centre for initiating and coordinating many reflex acts

Stimulus: An agent, as an environmental change, that directly influences the activity of a living organism or one of its parts by exciting a sensory organ or evoking muscular contraction or glandular secretion

# Amazing facts

1. Tapping the tendon below the kneecap causes the leg to jerk involuntarily because the impulse provoked by the tap, after travelling to the spinal cord, travels directly back to the leg muscle.
2. Reflex patterns are inherited rather than learned, having evolved as involuntary survival mechanisms.
3. Voluntary actions initiated in the brain may become reflex actions through continued association of a particular stimulus with a certain result.
4. In such cases, an alteration of impulse routes occurs that permits responses without mediation by higher nerve centres.
5. Such responses are called conditioned reflexes.
6. The most famous example of conditioned reflexes was performed by Ivan Pavlov with dogs.
7. After the dogs had learned to associate the provision of food with the sound of a bell, they salivated at the sound of the bell even when food was not offered.

5. Habit formation and much of learning are dependent on conditioned reflexes.

# Quiz

Q.1 Which of the following is correct about reflex action?

1. It is controlled by the brain.
2. It is controlled by the spinal cord.
3. It is an automatic and spontaneous response.
4. Both b and c.

Q.2 Which of the following correctly defines a reflex arc?

1. It is the path followed by the sensory nerve.
2. It is the path followed by the motor nerve.
3. It is the path followed by the sensory and motor nerves.
4. None of the above.

Q.3 Which of the following is not a part of the reflex arc?

1. The brain
2. The sensory organ
3. The relay neuron
4. The sensory and motor nerves

Q.4 Which of following acts as a receptor, when a hot object is touched?

1. The spinal cord
2. The sensory nerve
3. The skin
4. The motor nerve

Q.5 Which of the following nerve carries the stimulus from the skin along the dorsal root?

1. The motor nerve
2. The sensory nerve
3. The spinal nerve
4. The cranial nerve

Q.6 In the spinal cord, the impulse passes to the …………….

1. internunical neuron
2. dura mater
3. cerebrospinal fluid
4. pia mater

Q.7 The motor nerve takes the impulse away from the spinal cord, along the …………………….

1. dorsal root
2. ventral root
3. brain
4. organ

Q.8 Which of the following is not correct about the motor nerve?

1. The fine, branch-like endings of the motor nerve connect it to the effector organ.
2. It is also called the afferent nerve.
3. The internunical neuron transmits an impulse to the motor nerve.
4. The motor nerve carries an impulse along the ventral root.

**Answers:**

1.d, 2.c, 3.a, 4.c, 5.b, 6.a, 7.b, 8.b