

Class 10

Date

4.11.2024

Subject BIOLOGY

Teacher Nidhi Rana

Chapter 10 The Nervous System

Autonomic nervous system is strongly influenced by emotions. Prolonged emotional stress may lead to high blood pressure, stomach ulcers & other troubles.

Reflexes [Involuntary actions]

Voluntary actions which are performed consciously as per your own will Eg picking up an apple and eating it; Reading a book.

Involuntary actions which occur unknowingly (without a conscious effort) automatically.

Reflex action is a rapid, involuntary, automatic response to a stimulus. Eg. watering of mouth on seeing favourite food, blinking of eye, sneezing etc.

More differences and examples are given on Page 131 of text book. Table 10.2 Difference between voluntary and involuntary action.

All involuntary actions/reflexes are initiated by some kind of sensory stimulation (i.e. stimulus is required/must) resulting in either a muscular action or a glandular secretion.

Types of Reflexes

- i) Natural / inborn reflexes in which no previous experience or learning is required. Example - Blinking, coughing, sneezing - Protective

Conditioned / voluntarily acquired are learned responses to stimuli which an organism acquires individually during his lifetime. Such reflexes are easily changeable and induced/lost depending on environmental conditions.

Conditioned reflex is an involuntary spontaneous automatic response brought about due to previously learned experience.

Pavlov's experiment on dog. [Conditioned reflex]

Pavlov gave a classic example of conditioned reflex to sound. He observed that the sight and smell of food caused salivation in hungry dog. And in normal condition ringing of bell showed no response (or salivation) in dog.

Next he simultaneously sounded a bell and placed food in front of dog, the dog salivated. By repeating this process a number of times, a time came when the dog started salivating to the mere sounding of the bell. (food was not provided) as the dog learnt to correlate the bell with food. So bell substituted for the sight of food as a stimulus to induce salivation. Here the sound of bell was stimulus and the salivation - the conditioned reflex.

Our habits, likes, dislikes etc are conditioned reflexes. Conditioned reflexes play an important role in learning. Animals/birds are trained in circus through it.

Conditioned reflex is acquired during lifetime and is neither inherited nor transmitted to next generation.

Examples of Reflexes in humans

i) Natural / inborn reflexes

- i) Knee jerk - stretching of the tendon just under the knee, holding the knee cap in position/place. Immediate response occurs as the contraction of muscles of upper thigh so that the leg straightens.
- 2) Closing of eyelids against sudden approach of some thing towards it or pupil reflex towards bright light
- 3) Withdrawal of hands in response to hot flame
- 4) Peristaltic reflex - Chyme is propelled through small intestine by peristaltic waves.
- 5) Coughing, sneezing when any irritant enters the nose.

ii) Conditioned / Acquired reflexes -

- 1) Playing musical instruments
- 2) Typing on computer
- 3) Tying shoe laces
- 4) Applying brakes in your vehicle if someone suddenly comes in the front
- 5) Giving hand signal to your right automatically when you are turning your vehicle to the right.

Natural / inborn reflexes are directly related to stimulus and all similar in all humans.

Conditioned reflexes are developed by experience / learning and varies from person to person, subject to learning and experience.

Nervous pathway in reflex action / Reflexes.

Pathway of reflex action is termed as reflex arc. When we touch a hot object the stimulus passes through sensory nerve to spinal cord. From there the motor nerve brings the message to the muscles of hand to contract and hand is removed within a fraction of time from hot object.

Simple Reflex arc has following components -

- 1) Receptor - to perceive the stimulus
- 2) Sensory neuron - that carries messages from receptor to spinal cord.
- 3) Central Nervous System - It is the region in spinal cord / brain where incoming sensory impulse generates an outgoing motor impulse. In the centre there may be an association neuron between sensory and motor neuron.
- 4) Motor neuron - which carry impulses from spinal cord to the effector (gland/organs)
- 5) Effector - Muscle / gland that responds to motor nerve impulse.

Stimulus → Receptor → Sensory Neuron → CNS
Response ← Effector ← Motor Neuron ←

Complex reflex action involves neurons at different levels of spinal cord. Eg. while walking in the dark on road, if you happen to step on a coiled rope piece you suddenly jump aside with the fear of a suspected snake. Virtually all the skeletal

muscles are involved in this reflex.

Hence it is no longer a simple reflex at one level. This is complex reflex.

Home assignment

Q Answer the following Review questions (given on Page 136-137 in your text book) in your note book.

C. Short Answer type
Q No 3

D. Descriptive type
Q No 1 and 7

E. Structured / Application / skill type
Q No 1