

Control and Coordination Class 10 Notes

Introduction to Control and Coordination

The **class 10 NCERT Science** majorly covers **control and coordination** as a prime concept from the syllabus point of view. The human body is a complex machine that efficiently regulates millions of functions and processes for sustaining life. Hence, it is phenomenal to explore how the body manages **control and coordination** with the brain and other parts. In these control and coordination class 10 notes, we will explore some major concepts around the brain and other parts of the body.

The Nervous System

- The nervous system is a highly complex regulatory system in animals. It not only coordinates actions but also transmits sensory information and signals to/from the different parts of the body.
- The neuron is the structural and functional unit of the entire system.
- The ability of an organism to move a particular body part is known as a movement. The ability of an organism to move its whole body from one place to another is known as locomotion. The organisms undertake movement as a response to stimuli.

More About the Neuron

The animal nervous system is made up of specialized tissues which are known as nervous tissues. The neuron is the structural and functional unit of the nervous system, which is responsible for coordinating and controlling the complex actions in the animals. Neurons are the specialized cells in the nervous system which are responsible for the transmission of nerve impulses and it is divided into three parts-

1. Axon- axon is the tale of the neuron and it ends in fine hair-like structures known as axon terminals. This axon terminals rely on the nerve impulses
2. Cyton/soma/cell body- the site on or cell body of neurons is star-shaped having various hair-like structures protruding out of the margin. This hair like fine structures are known as dendrites which receive the nerve impulses
3. Myelin Sheath- the axon is covered by an insulator which is known as myelin Sheath. It insulates the axon against the nerve impulse from its surroundings.

In other words, Dendrites receive the impulse from other neurons. Cyton or Soma cells process the impulse. The impulse is further transmitted to the Axon. From there it gets transmitted either to other neurons or to the muscles for taking necessary action. Axons may be myelinated or unmyelinated. Impulse transmission is faster in myelinated neurons.

Types of Neurons

- Sensory neurons- These neurons receive the signals from a sense organ
- Motor neurons- These neurons send the signals to a gland or muscle
- Relay or association neuron- These neurons relay the signals between a motor neuron and sensory neuron.

Synapse

Synapse is a small gap between two adjacent neurons. In other words, it is a point contact between terminal branches of the axon of one neuron and with the dendrite of another neuron. Between the neurons, synapses convert the electric signals into chemicals that can cross over the gap between the axon and dendrite. Then the chemical message is passed to the next neuron and converted back to the electrical signal for interpretation. It also allowed the delivery of impulses from neurons to the cells such as glands or muscle cells.

How do Organisms Control and Coordinate?

Organisms move from one place to another in response to different kinds of stimuli like nutrients, food, water, heat, etc. All the activities in the animal body are thoroughly controlled and coordinated by the nervous system and the Endocrine System. Hormones are the core of the Endocrine System. They are also known as chemical messengers. Hormones are developed and secreted by the endocrine glands. Hormones assist the nervous system in carrying out various functions in different parts of the body.

The Central Nervous System

Next topic in our control and coordination class 10 notes is the nervous system. It is categorized into the central nervous system, the peripheral nervous system, and the autonomic nervous system. The central nervous system in the organisms is the primary **control and coordination** unit of the body. It is made up of the brain and the spinal cord. The central nervous system has major parts like medulla oblongata, cerebellum, pons Varolii, etc. The central nervous system is divided into forebrain, midbrain, and hindbrain. The function of the different parts of the central nervous system are-

Cerebrum

The cerebrum is the largest part of the human brain and it is divided into two hemispheres known as cerebral hemispheres.

Functions

- It is responsible for learning and memory
- It is the site of sensory perception like auditory perception or tactile
- It controls voluntary motor actions
- The cerebrum is responsible for emotions, logic, reasoning, visual processing, speech, auditory and taste stimuli recognition, etc.

Cerebellum

The cerebellum lies right below the cerebrum and at the back of the brain structure. The cerebellum coordinates the motor functions of the brain.

Functions

- It controls posture and balance
- It controls the precision of the voluntary actions
- The cerebellum is responsible for managing **control and coordination**, posture, and balance in the body.
- Pons Varolii manages the signals from the hindbrain to the forebrain.

Medulla

The medulla consists the brainstem along with pons and it lies at the back of the brain and extends up to the spinal cord. Medulla also controls the involuntary functions of the body like a heartbeat, respiration, etc.

- Medulla oblongata manages involuntary movements.
- Medulla oblongata continues to the spinal cord that runs across the vertebral column and regulates reflex actions.

Peripheral Nervous System

The peripheral nervous system has nerves originating from the brain and spinal cord. The human body has 12 cranial nerves and 31 spinal nerves.

Autonomic Nervous System

The chapter of **control and coordination class 10th** has various terminological concepts from the autonomic nervous system. The autonomic nervous system has all the nerves originating from the peripheral nervous system. It has two major divisions. They are known as the sympathetic and parasympathetic autonomic nervous systems. A sympathetic nervous system

regulates the body for intense activities, and it is also known as the fight or flight response. The parasympathetic nervous system is quite the opposite. It relaxes the body or slows down the high-energy functions of the body.

Reflex Action

As per the **control and coordination notes for class 10th**, reflex action is the involuntary action of the body in response to the stimuli generated from the reaction. Reflex arc refers to the path followed by the electric impulse generated during the reflex action. The impulse that travels from any receptor organ to the brain or the spinal cord is processed here. This information is brought back to the concerned origin (muscle) to carry out the necessary action. Hence, the receptor organ, sensory neuron, interneuron, effector organ, and efferent neurons are the components of the reflex arc.

Role of the brain in a reflex action

Reflex action occurs as an auto-generated for an instantaneous response towards stimuli where an individual has no status to give thought to the action. For example, sensory nerves are responsible for heat detection that is further connected to the nerves to move hands instantly. Here the entire process of detecting the heat signal from the nervous and responding to it towards moving the hand is referred to as a reflex arc. This reflex arc results in reflex action which is generated initially in the spinal cord and then the information is sent to the brain. It helps the brain to record the action and remember it for future reference. This information helps people to remain aware of similar stimuli or prevent themselves if the situation arises again.

Introduction to Receptors

Receptors in the nervous system and endocrine system of animals refers to the specialized nerve fibres that collect potential information. Receptors are also known as the sense organs of the animals and they are majorly classified as-

- Phono receptors- these receptors are present in the inner ear. Their main function is hearing and maintaining the balance of the body
- Photoreceptors- these receptors are present in the eye Their main function is supporting the visual stimuli
- Thermoreceptors- these receptors are present in and under the skin. They are responsible for touch, pain, and heat
- Olfactory receptors- these receptors are present in the nose. They assist in the smell
- Gustatory receptors- these receptors are present in the tongue. They assist in taste detection

Protection of the Central Nervous System

The brain is covered by the three main layers which are-

1. The bony skull (cranium)
2. The cerebrospinal fluid
3. The meninges (it is inclusive of the dura mater, Arkanoid meta, and pia mater)

Plant Hormones and Movement

In plants, control and coordination are carried out by their hormones. The major plant hormones are auxin, cytokinin, abscisic acid, gibberellins, etc. The plant hormones control activities like growth, cell division, seed germination, plant growth and movement, and various other functions.

Endocrine System

The endocrine system consists of numerous endocrine glands in which a ductless gland is known as the endocrine gland. This gland secretes the products directly into the bloodstream of the body. The hormones made up of proteins releasing in the body are also produced in endocrine glands. Hormones from endocrine glands assist in control and coordination systems. They are much needed to control and coordinate specific parts of the body.

Hormones

Hormones are the chemical messengers produced by endocrine glands and secreted in small amounts by specialized cells known as ductless glands. Hormones act on the target organs or tissues away from their releasing area. Endocrine systems assist in control and coordination with the chemical compounds known as hormones.

Similarly, the endocrine gland is a ductless gland that secretes the hormones directly into the bloodstream. The name of prominent endocrine glands, their location, hormones produced, and functions are as follows-

- **Pituitary gland-** It is also known as the master gland which is located at the base of the brain. Hormones produced are growth hormone (GH), thyroid-stimulating hormone (TSH), follicle-stimulating hormone (FSH). Its main function includes GH stimulates growth, FSH stimulates follicles during ovulation, and TSH stimulates thyroid gland functioning
- **Thyroid gland-** It is located in the neck. It produced hormone thyroxine. Its major function is thyroid gland controls growth and general metabolism in the body
- **Adrenal gland-** It is present above the kidneys. Hormones produced is adrenaline. Its function is to prepare the body for critical situations

