

Nervous system Notes

Coordination:

Coordination refers to the process by which different parts of the body work together to carry out functions smoothly. And ensuring a well-coordinated response to internal and external stimuli. It enables the body to carry out complex activities smoothly, like walking, talking, and reacting to danger.

It involves two main systems: nervous coordination and chemical coordination.

- 1. Nervous Coordination:** Nervous coordination is the regulation of body activities through the nervous system. It involves the transmission of electrical signals (nerve impulses) between different parts of the body to control voluntary and involuntary actions.

How It Works:

Sensory receptors like skin send a signal (nerve impulse) thorough sensory neuron to brain or spinal cord, and The brain interprets the signals and sends a response via motor neurons to the effector organs (muscles or glands). The effector organs carry out the appropriate action (e.g., moving a muscle or releasing a substance from a gland).

Example:

Touching a hot object and quickly pulling your hand away is a reflex action coordinated by the nervous system.

Explanation of example : Hot object touches to your skin and skin send signal to brain through sensory neurons , then brain interprets the signal and sen response via motor neurons to the skin so we quickly pulling our hand away

The time it takes for a reflex action to occur in the human body typically ranges from about **20 to 40 milliseconds** .

2. Chemical Coordination:

Definition:

Chemical coordination is the regulation of body functions through hormones produced by the endocrine system. Hormones are chemical messengers that travel through the bloodstream to target specific organs and tissues.

How It Works:

A change inside or outside the body (e.g., high blood sugar levels). The endocrine gland is stimulated to release a hormone (e.g., insulin from the pancreas). The hormone travels through the blood to the target organ (e.g., insulin signals liver cells to store glucose). The target organ carries out the desired function (e.g., lowering blood sugar).

Example:

After eating, blood sugar levels rise. The pancreas releases insulin, which signals cells to absorb glucose, thus lowering the blood sugar levels.

Integration of Nervous and Chemical Coordination:

Both systems work together to maintain homeostasis (stable internal conditions) and regulate body functions.

For instance, in response to stress, the nervous system quickly activates the adrenal glands to release adrenaline (a hormone), preparing the body for immediate action (fight or flight).

Importance of Coordination:

It allows the body to respond efficiently to changes in the environment. Ensures smooth functioning of different organ systems. Helps maintain balance (homeostasis) in the body.

Nervous system

The nervous system is a complex network of nerves and cells that carry messages to and from the brain and spinal cord to various parts of the body. It controls and coordinates all body activities.

Main Components of the Nervous System:

Central Nervous System (CNS):

Made up of the brain and spinal cord. It processes information and makes decisions.

Peripheral Nervous System (PNS):

Consists of nerves that branch out from the CNS to all parts of the body.

It transmits signals between the CNS and the rest of the body

Parts of the Nervous System:

Brain:

The control center of the body.

Divided into three parts:

Cerebrum: Largest part, controls intelligence, memory, thinking, and voluntary actions.

Cerebellum: Responsible for coordination and balance.

Medulla Oblongata: Controls involuntary actions like breathing, heart rate, and digestion.

Spinal Cord:

A long, tube-like structure that runs down the backbone. It transmits messages between the brain and the body.

Nerves:

Sensory nerves: Carry signals from sense organs (eyes, ears, skin, etc.) to the CNS.

Motor nerves: Transmit signals from the CNS to muscles or glands.

Neurons (Nerve Cells):

Basic unit of the nervous system.

A neuron consists of three parts:

Cell body: Contains the nucleus and cytoplasm.

Dendrites: Branch-like structures that receive signals from other neurons.

Axon: Long, thread-like part that transmits signals to other neurons or effectors (muscles or glands).

Neurons communicate through electrical impulses called nerve impulses.

Reflex Actions:

A reflex action is an automatic and rapid response to a stimulus. Reflexes are controlled by the spinal cord, not the brain, allowing for faster responses.

Example: Pulling your hand away quickly after touching something hot.

Reflexes are controlled by the spinal cord, not the brain, allowing for faster responses.

Functions of the Nervous System:

Sensory Function: Detects changes in the environment (stimuli) through sensory receptors.

Integration: Interprets the information received and processes it.

Motor Function: Initiates responses by activating muscles or glands.

How the Nervous System Coordinates:

Receiving and Responding to Stimuli:

1) Stimulus Detection:

Specialized receptors in the sensory organs (like eyes, ears, skin) detect changes in the environment, known as stimuli.

2)Transmission of Nerve Impulses:

Sensory neurons carry the detected information in the form of electrical impulses to the brain or spinal cord.

3)Processing in the CNS:

The brain interprets the incoming signals, deciding on the appropriate response.

4)Sending Instructions:

The brain or spinal cord sends signals through motor neurons to effectors (muscles or glands) to carry out a response

5)Response:

Muscles contract or relax, or glands secrete hormones based on the nerve signals they receive, ensuring an appropriate reaction to the stimulus.

Example:

If you touch a hot object, sensory receptors in your skin detect the heat. The sensory neurons transmit this information to your spinal cord, which processes the signal and sends a command to your hand muscles to pull away quickly. This is a reflex action, and the brain is informed afterward

Diseases of the Nervous System:

1. **Epilepsy:** A disorder where nerve cell activity in the brain becomes disturbed, causing seizures.
2. **Meningitis:** Inflammation of the protective membranes covering the brain and spinal cord.

Endocrine Glands and Hormones

- **Pituitary Gland:** Known as the “master gland” because it controls other glands. It secretes growth hormone (GH), which regulates body growth.
- **Thyroid Gland:** Produces thyroxine, which regulates metabolism.
- **Pancreas:** Produces insulin, which controls blood sugar levels.
- **Adrenal Glands:** Produce adrenaline, which helps the body respond to stress (“fight or flight” response).
- **Ovaries (in females):** Produce oestrogen and progesterone, which regulate the menstrual cycle and reproduction.
- **Testes (in males):** Produce testosterone, which regulates male reproductive functions.