Control and Coordination

Control and coordination refer to the process by which different parts of the body work together in a proper and organized way. In humans, this function is performed by the **nervous system** and **hormones**.

Example: When we touch a hot object, we quickly pull our hand back. This is due to control and coordination.

Nervous System

The nervous system is the main controlling system of the body. It receives information from the sense organs and sends instructions to different parts of the body.

Example: Eyes see an object and send signals to the brain, which tells the body how to react.

Neuron (Nerve Cell)

A neuron is the structural and functional unit of the nervous system. It carries information in the form of electrical signals (nerve impulses) from one part of the body to another.

Parts of a Neuron:

1. Dendrites – Receive information from receptors or other neurons.

Example: Receiving sensation of heat or cold.

2. Axon – Transmits electrical impulses away from the cell body.

Example: Carrying signals to muscles.

3. Synapse – The junction where one neuron passes the signal to another using chemicals.

Example: Transmission of signal between two nerve cells.

Nerve Impulse

A nerve impulse is the electrical signal generated in a neuron in response to a stimulus.

Example: Feeling pain when pricked by a needle.

Reflex Action

A reflex action is a quick, automatic, and involuntary response to a stimulus without conscious thinking.

Examples:

- Pulling hand away from a hot object
- Sneezing or coughing
- Blinking eyes in bright light

Reflex Arc

The pathway followed during a reflex action is called a reflex arc. It includes:

- Sensory nerve
- Spinal cord
- Motor nerve

Types of Nervous System

1. Central Nervous System (CNS)

It consists of the brain and spinal cord. It collects and processes information.

Example: Thinking, decision making

2. Peripheral Nervous System (PNS)

It consists of cranial nerves and spinal nerves. It connects CNS to the rest of the body.

Example: Carrying signals to and from limbs

3. Autonomic Nervous System (ANS)

It controls involuntary activities like heartbeat and digestion.

Types:

- Sympathetic (active state)
- Parasympathetic (resting state)

Brain

The brain is the main control center of the body. It is protected inside the skull and cushioned by fluid.

- Parts of Brain:

1. Forebrain – Responsible for thinking, memory, and sensory processing

Example: Solving a problem

2. Midbrain – Controls some involuntary actions

Example: Eye movement

3. Hindbrain – Maintains balance and coordination

Example: Walking, maintaining posture

Types of Nerves

1. Sensory Nerves – Carry impulses from sense organs to brain

Example: Feeling pain

2. Motor Nerves – Carry impulses from brain to muscles

Example: Moving hands

3. Mixed Nerves – Perform both functions

Plant Movements

Plants also show movement, which can be:

1. Growth-dependent movement

Example: Growth of stem

2. Growth-independent movement

Example: Folding of leaves

Types of Plant Movements

1. Seismonasty – Response to touch or shock

Example: ***Mimosa pudica*** (touch-me-not) leaves fold on touch

2. Phototropism– Movement towards light

- Stem grows towards light

3. Geotropism – Response to gravity

- Roots grow downward (positive), stem upward (negative)

4. Hydrotropism – Response to water

- Roots grow towards water

5. Thigmotropism – Response to touch

Example: Tendrils of pea plant coil around support

6. Chemotropism – Response to chemicals

Example: Pollen tube grows towards ovule

Plant Hormones

Plant hormones are chemical substances that control growth and development in plants.

Types:

1. Auxin – Promotes cell elongation

Example: Growth of shoot

2. Gibberellin – Promotes stem growth

3. Cytokinin – Promotes cell division

Example: Found in fruits and seeds

4. Abscisic Acid – Inhibits growth

Endocrine System

The endocrine system consists of ductless glands that secrete hormones directly into the blood.

Hormones

Hormones are chemical messengers that regulate various body functions like growth, metabolism, and reproduction.

Important Endocrine Glands

1. Pituitary Gland

- Secretes growth hormone
- Deficiency causes dwarfism

2. Thyroid Gland

- Secretes thyroxine
- Iodine deficiency causes goitre

3. Pancreas (Islets of Langerhans)

- Secretes insulin
- Deficiency causes diabetes

4. Testis (male)

- Secretes testosterone
- Develops male characteristics

5. Ovary (female)

- Secretes estrogen
- Develops female characteristics

Feedback Mechanism

Hormone secretion is controlled by a feedback mechanism to maintain balance in the body.

Example: Excess thyroxine reduces its further secretion.