

Prodigy Educlasses

CBSE • Class X

CONTROL AND COORDINATION



Human Brain and Spinal Cord



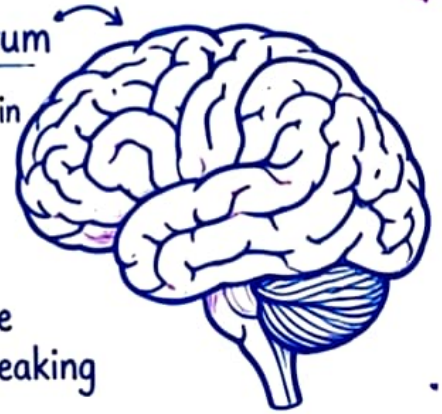
Human Brain - Parts & Functions

★ Key Points to Remember: ★

- Brain is the main coordination centre of the body
- Cerebrum — thinking, memory, and decision making
- Cerebellum — helps in balance, posture, and coordination
- Medulla — controls automatic functions like heart beat & breathing
- Spinal Cord — transmits signals and controls reflex actions

Forebrain → Cerebrum

- Largest part of the brain
- Controls thinking, memory, intelligence
- Responsible for voluntary actions like reading, writing, speaking



→ Midbrain

- Acts as relay between forebrain & hindbrain
- Controls reflexes of sight & hearing
- Regulates eye movement & pupil response

→ Hindbrain { Cerebellum →

- Maintains balance & posture of the body
- Coordinates muscle movement for smooth actions
- Controls precision in voluntary movements

Medulla (Medulla Oblongata) —

- Controls involuntary life functions
- Regulates breathing, heartbeat, blood pressure
- Manages swallowing, coughing, sneezing reflexes

Reflex Action — Quick Response to Stimulus

- A sudden, automatic response to a stimulus
- Example: When hand touches hot object, we pull it away immediately → controlled by spinal cord, without brain involvement

Note: All these parts work together for proper control & coordination!

Spinal Cord

- Connects the brain to the rest of the body
- Carries nerve impulses between brain and body
- Controls reflex actions



Fun Fact: The brain has over 100 billion neurons and weighs about 1.3-1.4 kg in humans!

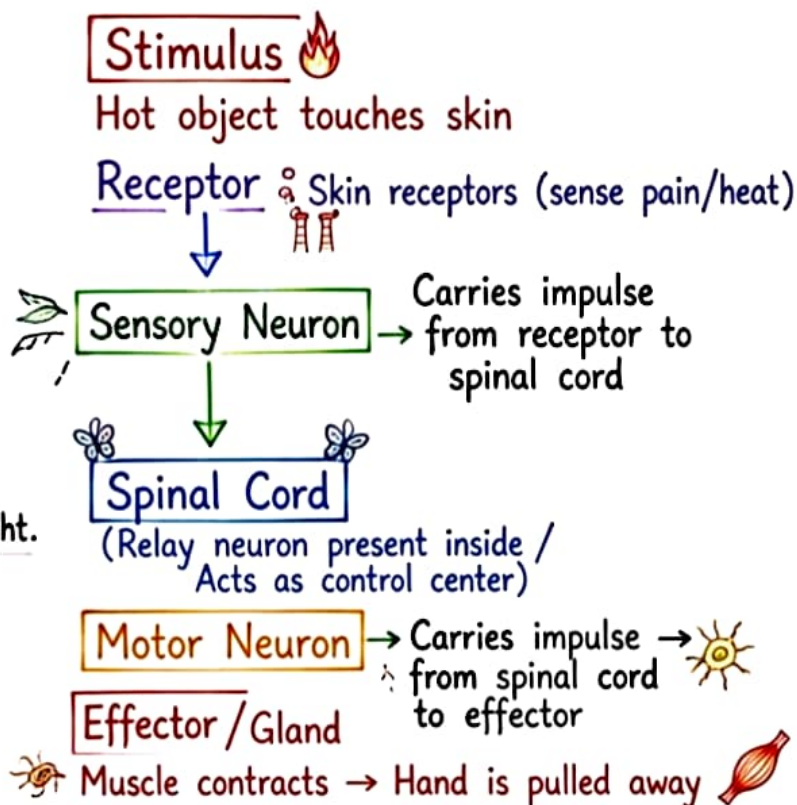


★ 1. REFLEX ARC

Reflex Arc : The pathway through which a reflex action occurs. It is an automatic, quick, response to a stimulus.

Reflex Action : A sudden, rapid, automatic response to a stimulus that protects the body from harm.

Example : Touching a hot pan → hand is withdrawn immediately without conscious thought.



★ **Key** : This whole process is automatic & rapid. It is controlled by the spinal cord, not the brain. Helps in immediate protection.

2. CHEMICAL COORDINATION IN ANIMALS

Chemical Coordination : Communication inside the body using chemical messengers called Hormones.

- **Hormones** : Chemicals secreted by endocrine glands, carried via blood, regulate growth, metabolism, reproduction, etc. Slower but longer-lasting effect.

★ Endocrine Glands & Their Hormones : ✧

- **Pituitary Gland** – Located at the base of the brain, beneath the hypothalamus.
 - Known as the "Master Gland" because it controls other endocrine glands.
 - Secretes : Growth Hormone (GH) → regulates growth & development.
- **Thyroid Gland** – Located in the neck, in front of the windpipe.
 - Secretes : Thyroxine hormone → regulates metabolism, growth, and body temperature.
 - Deficiency of thyroxine → Goitre (swelling of neck).
- **Adrenal Gland** – Located on top of each kidney.
 - Secretes : Adrenaline hormone → also called "fight or flight" hormone.
 - Increases heartbeat, blood pressure, and breathing during stress/danger.

KEY POINTS TO REMEMBER:

- Nervous Coordination (Reflex Arc) = Fast, occurs via neurons, short-lived.
- Chemical Coordination (Hormones) = Slower, occurs via bloodstream, long-lasting.

★ Both nervous and chemical coordination work together to maintain homeostasis in the body. ☺

Control and Coordination



Coordination in Plants



Plants respond to their surroundings through growth and movement. Unlike animals, plants lack a nervous system, so they coordinate using chemical signals called plant hormones.

→ Tropism (Tropic Movements) →

Tropism = Growth movement of plant in response to a stimulus. It is directional and depends on the direction of the stimulus.

- **Phototropism** — Growth towards light 
- **Geotropism** — Growth towards gravity. Roots → positive geotropism (downwards), Shoot → negative geotropism (upwards) 
- **Hydrotropism** — Growth towards water 
- **Chemotropism** — Growth in response to chemicals. Eg: Pollen tube grows towards chemicals released by ovule
- **Thigmotropism** — Growth in response to touch/contact. Eg: Tendril of pea plant coils around support 

→ Nastic Movements

Non-directional movement, not dependent on direction of stimulus. Usually fast, reversible.

Eg: Mimosa pudica leaves fold when touched, Dandelion closes at night.

→ Plant Hormones (Phytohormones)

- **Auxin** — Promotes cell elongation, helps in phototropism. Produced at shoot tip.
- **Gibberellin** — Promotes stem growth, seed germination, flowering.
- **Cytokinin** — Promotes cell division, delay ageing of leaves.
- **Abscissic Acid (ABA)** — Growth inhibitor. Promotes dormancy, stomatal closure during drought. Also called stress hormone.
- **Ethylene** — Growth inhibitor, promotes fruit ripening, falling of leaves.



Key Point: Tropism = direction towards/away from stimulus
| Nastic = non-directional, rapid



* These hormones balance growth & development *