

TOPIC: CONTROL AND COORDINATION

INTRODUCTION: CONTROL AND COORDINATION

In the previous chapter, we studied **life processes**, which are essential for maintaining life in organisms. One common idea we all have is:

👉 “If something moves, it is alive.”

However, this idea is only **partially correct**.

◇ Types of Movement

There are **two types of movements** in living organisms:

1. Growth-Based Movement (Slow)

- Seen mainly in plants
- Example: Seed germination
- The seed grows and pushes through the soil
- This movement **depends on growth**

👉 Important:

If growth stops → movement also stops

2. Non-Growth Movement (Fast)

- Seen in animals and some plants
- Examples:
 - Cat running
 - Children playing
 - Buffalo chewing cud

👉 These movements:

- Do NOT depend on growth
- Are immediate and active

WHY DO ORGANISMS MOVE?

Movement happens due to **stimulus (change in environment)**.

👉 Examples:

- Cat runs after seeing a mouse
- Plant grows towards sunlight
- Human pulls hand from heat

So, movement is actually a:

👉 **Response to stimulus**

ROLE OF MOVEMENT IN SURVIVAL

Movement helps organisms:

- Protect themselves (danger → escape)
- Get food (hunt or digest)
- Adjust to environment (light, temperature)

👉 Example:

- Buffalo chews cud → better digestion
- Plants grow towards sunlight → more photosynthesis

IMPORTANT CONCEPT: CONTROLLED MOVEMENT

Movement is **not random** — it is carefully controlled.

👉 Each stimulus produces a **specific response**

Example:

- In class → we whisper
- In playground → we shout

👉 So, response depends on situation

FINAL CONCLUSION

Living organisms must have a system that:

1. Detects stimulus
2. Processes information
3. Produces correct response

This system is called:

CONTROL AND COORDINATION

It is carried out by **specialised tissues** in multicellular organisms.

◇ **KEY POINTS**

- Movement = Sign of life
- Two types:
 - Growth-based
 - Non-growth-based
- Stimulus → Response → Survival

◇ RECALL LINK (PREVIOUS CHAPTER)

👉 Life Processes:

- Movement is essential
- Growth causes plant movement

◇ CORE IDEA

👉 Movement = Response to environment

👉 Response must be **controlled**

◇ REAL-LIFE EXAMPLES

- Touch hot object → withdraw hand
- Bright light → close eyes
- Sunlight → plant bends

◇ MNEMONIC

👉 “MSRC”

- M = Movement
- S = Stimulus
- R = Response
- C = Control

TOPIC: ANIMALS – NERVOUS SYSTEM

In animals, **control and coordination** are carried out by two main tissues:

1. **Nervous tissue**
2. **Muscular tissue**

👉 The nervous system helps in:

- Detecting changes (stimuli)
- Sending signals
- Producing responses

HOW DO WE DETECT STIMULUS?

When we touch a hot object, it is a **dangerous situation**, so the body must:

1. Detect the heat
2. Send information quickly
3. Respond immediately

This detection is done by **receptors**.

◇ Receptors

- Specialised tips of nerve cells
- Present in **sense organs**

Examples:

- Tongue → taste (gustatory receptors)
- Nose → smell (olfactory receptors)
- Skin → touch

⚡ HOW DOES NERVOUS IMPULSE TRAVEL?

The working of a neuron occurs in steps:

📄 Step-by-Step Process:

1. Stimulus is detected by **dendrite**
2. A **chemical reaction** starts
3. This creates an **electrical impulse**
4. Impulse travels:
 - a. Dendrite → Cell body → Axon
5. At axon end:
 - a. Chemicals are released
6. These chemicals cross the **synapse** (gap)
7. Next neuron receives the signal

👉 Finally, the signal reaches:

- Muscles → movement
- Glands → secretion

🔄 IMPORTANT CONCEPT: SYNAPSE

- Synapse = gap between two neurons
- Electrical signal becomes **chemical signal** here
- Then again converted into electrical signal

👉 This ensures signal transfer from one neuron to another

🔄 STRUCTURE OF NEURON (VERY IMPORTANT)

| Part | Function |
|-----------|-----------------------|
| Dendrite | Receives information |
| Cell Body | Processes information |

| | |
|------|-------------------|
| Axon | Sends information |
|------|-------------------|

FINAL UNDERSTANDING

The nervous system works as a **communication network**:

- Detects information
- Sends signals using electrical impulses
- Produces quick responses

👉 That's why responses like touching heat are **very fast**

◇ KEY POINTS

- Nervous system = fast control
- Neuron = basic unit
- Signal = Electrical + Chemical

◇ RECALL LINK (PREVIOUS TOPIC)

👉 Control & Coordination:

- Stimulus → Response
- Nervous system handles fast response

◇ IMPORTANT FLOW (MUST REMEMBER)

👉 **Stimulus → Receptor → Neuron → Brain/Spinal cord → Response**

◇ MNEMONIC

👉 **“DCA-S”**

- D = Dendrite
- C = Cell body
- A = Axon
- S = Synapse

◇ EXAM TIP (VERY IMPORTANT)

👉 Write this line:

“Nervous tissue transmits information through electrical impulses.”



TOPIC: REFLEX ACTION

◇ What is Reflex Action?

Reflex action is a **quick, automatic, and involuntary response** to a stimulus without conscious thinking.

👉 Examples:

- Pulling hand away from fire
- Blinking eyes in bright light
- Salivation on seeing food

👉 Key Idea:

We respond **without thinking or control**

⚡ WHY REFLEX ACTION IS NEEDED?

Let's understand with an example:

👉 Touching a hot object is dangerous

If we wait to:

- Think about pain
- Decide action

👉 It will take time → we may get burnt

! Problem:

- Brain thinking is **slow**
- It involves many neurons and complex processing



SOLUTION: REFLEX ARC

To save time, the body uses a shortcut called:



REFLEX ARC

Instead of sending signals to the brain first, the body:

- Responds directly through the **spinal cord**



PATHWAY OF REFLEX ACTION

Step-by-Step Flow:

1. Stimulus (heat)
2. Receptor (skin detects heat)
3. Sensory neuron → carries signal
4. Spinal cord → processes quickly

5. Motor neuron → sends response
6. Effector (muscle) → action (hand withdraws)

IMPORTANT POINT

👉 Reflex action is controlled by:

SPINAL CORD (NOT brain initially)

✓ But:

- Information still goes to brain later
- Brain becomes aware after action

WHY REFLEX ARC IS FAST?

- Short pathway
- No complex thinking
- Direct connection in spinal cord

👉 Therefore:

✓ Quick response

✓ Protection from danger

EVOLUTIONARY IMPORTANCE

- Reflex actions developed because:
 - Brain thinking is slow
 - Survival needs quick response
- 👉 Even in advanced animals:
 - Reflex actions are still used for speed

FINAL UNDERSTANDING

Reflex action is a **protective mechanism** that:

- Saves time
- Prevents injury
- Works automatically

◇ **KEY POINTS**

- Reflex = Automatic response
- Fast and involuntary

- Controlled by spinal cord

◇ RECALL LINK

👉 Nervous System:

- Neuron carries impulse
- Synapse transfers signal

◇ FLOW (VERY IMPORTANT FOR EXAM)

👉 Stimulus → Receptor → Sensory neuron → Spinal cord → Motor neuron → Muscle

◇ MNEMONIC

👉 “SRSSMM”

- S = Stimulus
- R = Receptor
- S = Sensory neuron
- S = Spinal cord
- M = Motor neuron
- M = Muscle

◇ DIFFERENCE (IMPORTANT)

| Reflex Action | Voluntary Action |
|---------------|-------------------|
| No thinking | Thinking required |
| Very fast | Slower |
| Spinal cord | Brain |

◇ EXAM TIP

👉 Write this line:

“Reflex actions are quick, automatic responses controlled by the spinal cord through a reflex arc.”

◇ CONCEPT LINKING

- Connect with:
 - Neuron
 - Synapse
 - Brain

◇ APPLICATION QUESTION

👉 Bright light on eyes:

Sequence:

Light → Eye receptor → Sensory neuron → Brain → Motor response → Eyelid closes

◇ COMMON MISTAKE

✗ Reflex is controlled by brain

✓ It is controlled by **spinal cord first**

📖 TOPIC: HUMAN BRAIN

◇ Role of Brain

Reflex action is not the only function of the nervous system.

Humans can **think, analyse, and make decisions**, which is controlled by the **brain**.

👉 The brain is the:

Main coordinating centre of the body

🌐 CENTRAL NERVOUS SYSTEM (CNS)

The nervous system is divided into:

1. Central Nervous System (CNS)

- Brain + Spinal cord
- Receives and processes information

2. Peripheral Nervous System (PNS)

- Cranial nerves (from brain)
- Spinal nerves (from spinal cord)
- Connects CNS to body parts

👉 Function:

- Carry messages between brain and body

⚡ TYPES OF ACTIONS

◇ 1. Voluntary Actions (Controlled by Brain)

- Done with thinking
- Examples:
 - Writing

- Walking
- Talking
- 👉 Brain:
- Receives information
- Thinks
- Sends command to muscles

◇ 2. Involuntary Actions (Automatic)

- No conscious control
- Examples:
- Heartbeat
- Breathing
- Digestion

◇ 3. Reflex Actions

- Fast and automatic
- Controlled by spinal cord

PARTS OF THE BRAIN (VERY IMPORTANT)

The brain has **three main parts**:

◇ 1. Forebrain (Cerebrum)

👉 Main thinking part

Functions:

- Thinking
- Decision making
- Memory
- Intelligence
- Sensory interpretation

👉 Special feature:

- Separate areas for:
- Vision
- Hearing
- Smell

👉 Also controls:

- Hunger (feeling full)

◇ 2. Midbrain

👉 Controls some **involuntary actions**

Functions:

- Reflex movements (eye movement, pupil size)

◇ 3. Hindbrain

Includes:

- **Cerebellum**
- **Medulla**

◇ *Cerebellum*

- Maintains **balance and posture**
- Controls **precision of movement**

👉 Examples:

- Walking straight
- Riding bicycle
- Picking objects

◇ *Medulla (Very Important)*

Controls:

- Heartbeat
- Breathing
- Blood pressure
- Vomiting

👉 These are **life-saving involuntary actions**

🎯 FINAL UNDERSTANDING

The brain:

- Receives information
- Processes it
- Sends commands

👉 It controls:

- ✓ Voluntary actions
- ✓ Involuntary actions
- ✓ Thinking and intelligence

◇ KEY POINTS

- Brain = control centre
- CNS = Brain + Spinal cord
- PNS connects body to brain

◇ RECALL LINK

👉 Reflex Action:

- Controlled by spinal cord

👉 Nervous System:

- Neuron transmits signals

◇ BRAIN PARTS (SHORT TRICK)

👉 “FMH”

- F = Forebrain (thinking)
- M = Midbrain (reflex)
- H = Hindbrain (balance + involuntary)

◇ QUICK TABLE

| Part | Function |
|------------|----------------------|
| Forebrain | Thinking, memory |
| Midbrain | Reflex actions |
| Cerebellum | Balance |
| Medulla | Breathing, heartbeat |

◇ EXAM TIP

👉 Always write:

“Forebrain controls thinking, hindbrain controls involuntary actions.”

◇ CONCEPT LINKING

- Connect with:
 - Reflex arc
 - Neuron
 - Hormones (next topic)

◇ REAL-LIFE CONNECTION

- Feeling full → forebrain
- Balance while cycling → cerebellum
- Breathing → medulla

◇ COMMON MISTAKE

- ✗ Brain controls only thinking
- ✓ Brain controls thinking + voluntary + involuntary actions

TOPIC: PROTECTION OF NERVOUS TISSUES & ACTION OF MUSCLES

◇ 1. Protection of Brain and Spinal Cord

The **brain** is a very delicate and important organ, so it needs strong protection.

Protection of Brain:

1. **Skull (Cranium)**
 - a. Brain is enclosed in a **bony box**
 - b. Protects from external injury
2. **Fluid Protection (Cerebrospinal Fluid)**
 - a. Brain is surrounded by a **fluid-filled space**
 - b. Acts as a **shock absorber**
 - c. Prevents damage from jerks

Protection of Spinal Cord:

- The spinal cord is protected by the:

Vertebral Column (Backbone)

👉 Features:

- Hard, bumpy structure
- Made of bones (vertebrae)
- Protects spinal cord from injury

⚡ 2. How Nervous Tissue Causes Action

So far we learned:

- Nervous tissue detects and sends signals

👉 But who performs the action?

Muscles perform the final action

PROCESS OF ACTION (VERY IMPORTANT)

1. Brain/spinal cord sends signal
2. Nerve impulse reaches muscle
3. Muscle responds by **contracting (shortening)**
4. Movement occurs

HOW DO MUSCLES MOVE?

At cellular level:

- Muscle cells contain **special proteins**
- These proteins:
 - Change shape
 - Rearrange inside the cell
- 👉 Result:
 - Muscle becomes shorter (contracts)
 - This causes movement

◇ TYPES OF MUSCLES (IMPORTANT LINK)

1. Voluntary Muscles

- Under our control
- Example:
 - Walking
 - Writing

2. Involuntary Muscles

- Not under control
- Example:
 - Heartbeat
 - Digestion

FINAL UNDERSTANDING

- Brain sends signal → muscle acts
- Muscles create movement by **contraction**
- Nervous + muscular system work together

◇ KEY POINTS

- Brain protected by skull + fluid
- Spinal cord protected by backbone
- Muscles perform action

◇ RECALL LINK

👉 Human Brain:

- Control centre

👉 Reflex Action:

- Spinal cord sends quick signals

◇ FLOW (VERY IMPORTANT)

👉 **Stimulus → Nerve impulse → Muscle → Movement**

◇ MNEMONIC

👉 **“SBM”**

- S = Signal
- B = Brain
- M = Muscle

◇ EXAM TIP 💧

👉 Write this line:

“Muscles bring about movement by contraction in response to nervous impulses.”

◇ CONCEPT LINKING

- Connect with:
 - Neuron
 - Brain
 - Reflex arc

◇ REAL-LIFE EXAMPLE

- Kick a ball → brain sends signal → leg muscle contracts
- Touch heat → reflex → muscle pulls hand

◇ COMMON MISTAKE

✗ Brain directly moves body

- ✓ Muscles perform movement

TOPIC: COORDINATION IN PLANTS

◇ **Do Plants Have Control & Coordination?**

Unlike animals, plants:

- ✗ Do NOT have a nervous system
- ✗ Do NOT have muscles
- 👉 Still, plants **respond to stimuli** (changes in environment)

EXAMPLES OF PLANT RESPONSE

1. **Touch-me-not (Mimosa) plant**

- Leaves fold when touched
- Quick response

2. **Seed germination**

- Root grows downward
- Shoot grows upward

◇ **TYPES OF MOVEMENTS IN PLANTS**

Plants show **two types of movement**:

1. **Growth-Dependent Movement (Slow)**

- Movement occurs due to **growth**
- Example:
 - Root growing downward
 - Shoot growing upward

👉 Important:

If growth stops → movement stops

2. **Growth-Independent Movement (Fast)**

- No growth involved
- Example:
 - Mimosa leaves folding

👉 This movement is:

- Quick
- Temporary

⚡ IMMEDIATE RESPONSE IN PLANTS (VERY IMPORTANT)

◇ Problem:

Plants have:

- No nerves
- No muscles

👉 Then how do they respond?

📁 HOW SIGNAL IS TRANSMITTED IN PLANTS

Plants use:

👉 Electrical + Chemical signals

- Signal travels **cell to cell**
- No specialised tissue like neurons

🌿 HOW DO LEAVES MOVE?

Movement occurs due to **change in shape of cells**

👉 How?

- Plant cells absorb or lose **water**
- This causes:
 - Swelling (gain water)
 - Shrinking (lose water)

👉 Result:

- Leaves fold or open

🎯 FINAL UNDERSTANDING

Plants:

- Detect stimulus
- Send signals (chemical + electrical)
- Change cell shape
- Produce movement

👉 Even without nerves and muscles!

◇ KEY POINTS

- Plants have no nervous system
- Still show response to stimuli
- Two types of movement

◇ RECALL LINK

👉 Previous topic:

- Nervous system in animals

👉 Difference:

- Animals → nerves
- Plants → chemicals

◇ TYPES (VERY IMPORTANT)

👉 Growth dependent → slow

👉 Growth independent → fast

◇ MNEMONIC

👉 “GG”

- G = Growth movement
- G = Quick (non-growth) movement

◇ EXAM TIP

👉 Write:

“Plants respond to stimuli using chemical and electrical signals without a nervous system.”

◇ CONCEPT LINKING

- Connect with:
 - Hormones (next topic)
 - Tropism

◇ REAL-LIFE EXAMPLE

- Mimosa folds leaves → touch response
- Roots grow down → gravity response

◇ COMMON MISTAKE

✗ Plants do not respond

✓ Plants respond without nerves

TOPIC: MOVEMENT DUE TO GROWTH (TROPISM) + PLANT HORMONES

1. Movement Due to Growth

Some plants (like pea plants) climb using **tendrils**.

👉 How?

- Tendrils are **sensitive to touch**
- When they touch support:
 - Side touching support → grows slowly
 - Opposite side → grows faster

👉 Result:

- Tendril bends and coils around support

2. TROPISM (VERY IMPORTANT)

👉 Definition:

Tropism is the **directional growth movement of plants in response to stimulus**

TYPES OF TROPISM

◇ 1. Phototropism (Light)

- Shoot → grows **towards light**
 - Root → grows **away from light**
- 👉 Helps plant:
- Get maximum sunlight for photosynthesis

◇ 2. Geotropism (Gravity)

- Root → grows **downwards**
 - Shoot → grows **upwards**
- 👉 Helps:
- Root gets water/minerals
 - Shoot reaches sunlight

◇ 3. Hydrotropism (Water)

- Growth towards water

👉 Example:

Roots grow towards moist soil

◇ 4. Chemotropism (Chemicals)

- Growth in response to chemicals

👉 Example:

Pollen tube grows towards ovule

⚡ IMPORTANT CONCEPT

👉 Growth movement is:

- Slow
- Permanent
- Directional

🔍 ACTIVITY (VERY IMPORTANT FOR EXAM)

Observation:

- Shoot bends towards light
- Root bends away from light

Conclusion:

👉 Plants show **phototropism**

👉 Important:

- Old parts do NOT change direction
- New growth shows change

⚡ 3. HOW DO PLANTS COMMUNICATE?

Two ways:

◇ Electrical Signals

- Fast
- Limited (only nearby cells)

◇ Chemical Signals (Hormones)

- Slow
- Reach all cells

👉 Plants mainly use:

CHEMICAL COMMUNICATION

4. PLANT HORMONES (VERY IMPORTANT)

Hormones control:

- Growth
- Development
- Response to environment

◇ AUXIN (MOST IMPORTANT)

👉 Function:

- Helps cells grow longer

👉 How bending occurs:

- Light from one side
- Auxin moves to shady side
- Cells grow more on shady side

👉 Result:

- Plant bends towards light

◇ OTHER HORMONES

1. Gibberellins

- Stem growth

2. Cytokinins

- Cell division
- Found in fruits & seeds

3. Abscisic Acid

- Stops growth
- Causes wilting

FINAL UNDERSTANDING

- Plants move due to **growth + hormones**
- Hormones control direction and speed
- Tropism helps plant survive

◇ KEY POINTS

- Tropism = directional growth
- Movement due to unequal growth
- Controlled by hormones

◇ RECALL LINK

👉 Previous topic:

- Immediate movement (Mimosa)

👉 Now:

- Growth movement (slow)

◇ TYPES (VERY IMPORTANT)

👉 “PGHC”

- P = Phototropism
- G = Geotropism
- H = Hydrotropism
- C = Chemotropism

◇ FLOW (EXAM IMPORTANT)

👉 Stimulus → Hormone → Unequal growth → Bending

◇ EXAM TIP 💧

👉 Write:

“Tropism is directional growth movement controlled by plant hormones.”

◇ AUXIN TRICK (VERY IMPORTANT)

👉 “Auxin → Away from light → Growth more → Bending”

◇ REAL-LIFE CONNECTION

- Sunflower turns towards sun
- Roots grow towards water

◇ COMMON MISTAKE

✗ Movement due to muscle

✓ Movement due to growth

◇ HIGH-VALUE QUESTION

👉 Why plant bends towards light?

✓ Because auxin accumulates on shaded side → more growth → bending

TOPIC: HORMONES IN ANIMALS (ENDOCRINE SYSTEM)

◇ 1. What are Hormones?

Hormones are **chemical messengers** that control and coordinate body activities.

👉 They are:

- Secreted by **endocrine glands**
- Transported through **blood**
- Act on **target organs**

⚡ WHY HORMONES ARE NEEDED?

Nervous system:

- Fast but limited

Hormones:

- Slow but affect **whole body**

👉 Therefore:

Hormones provide long-lasting and widespread control

⚡ 2. EMERGENCY RESPONSE (ADRENALINE)

👉 Situation:

- Fear / danger (fight or flight)

◇ **Hormone:**

👉 **Adrenaline** (from adrenal glands)

EFFECTS OF ADRENALINE

1. Heartbeat increases
2. Breathing rate increases
3. More oxygen reaches muscles
4. Blood shifts:
 - a. Away from digestion
 - b. Towards muscles

👉 Result:

✓ Body becomes ready for action

3. ENDOCRINE SYSTEM

👉 Group of glands that produce hormones

Examples:

- Pituitary
- Thyroid
- Pancreas
- Adrenal

4. ROLE OF HORMONES IN GROWTH

Hormones ensure:

- Proper body design
- Controlled growth

👉 Example:

- We don't grow body parts randomly

5. IMPORTANT HORMONES (VERY IMPORTANT)

◇ 1. Thyroxine (Thyroid gland)

👉 Function:

- Controls metabolism

👉 Needs:

- Iodine

👉 Deficiency:

- Goitre (swollen neck)

◇ 2. Growth Hormone (Pituitary)

👉 Function:

- Controls body growth

👉 Deficiency:

- Dwarfism

👉 Excess:

- Giant height

◇ 3. Sex Hormones

- Testosterone (male)
- Oestrogen (female)

👉 Function:

- Changes during puberty

◇ 4. Insulin (Pancreas)

👉 Function:

- Controls blood sugar

👉 Deficiency:

- Diabetes

6. FEEDBACK MECHANISM (VERY IMPORTANT)

👉 Hormone levels are controlled automatically

Example:

- Blood sugar ↑ → Insulin ↑
- Blood sugar ↓ → Insulin ↓

👉 This maintains balance in body

FINAL UNDERSTANDING

- Hormones control body functions
- Travel through blood
- Act slowly but widely
- Maintain balance and growth

◇ KEY POINTS

- Hormones = chemical control
- Endocrine system controls hormones
- Works with nervous system

◇ RECALL LINK

👉 Plants:

- Hormones control growth

👉 Animals:

- Hormones control body functions

◇ IMPORTANT FLOW

👉 Gland → Hormone → Blood → Target organ → Response

◇ MNEMONIC (HORMONES)

👉 “TGISA”

- T = Thyroxine
- G = Growth hormone
- I = Insulin
- S = Sex hormones
- A = Adrenaline

◇ EXAM TIP 💧

👉 Write:

“Hormones are chemical messengers secreted by endocrine glands and transported through blood to target organs.”

◇ REAL-LIFE CONNECTION

- Fear → adrenaline → fast heartbeat
- Puberty → body changes
- Diabetes → insulin problem

◇ COMMON MISTAKE

✗ Hormones act fast like nerves

✓ Hormones act slowly but widely

◇ HIGH-VALUE QUESTIONS

👉 Why iodised salt is important?

✓ Needed for thyroxine

👉 Why insulin injection given?

✓ To control blood sugar

▣ CONTROL AND COORDINATION – IMPORTANT Q&A

SHORT ANSWERS

1. How does chemical coordination take place in animals?

Chemical coordination occurs through **hormones** secreted by endocrine glands.

These hormones travel through **blood** and act on specific target organs to control body functions.

2. Why is the use of iodised salt advisable?

Iodised salt contains iodine which is needed to produce **thyroxine hormone**.

Deficiency of iodine can cause **goitre (swelling of neck)**.

3. How does our body respond when adrenaline is secreted into the blood?

When adrenaline is released:

- Heartbeat increases
- Breathing rate increases
- Blood flows more to muscles
- Digestion slows down

👉 This prepares the body for **fight or flight**

4. Why are some diabetes patients given insulin injections?

Insulin controls **blood sugar levels**.

In diabetes, insulin is not produced properly, so injections are given to **maintain normal sugar level**.

MCQs (OBJECTIVE)

1. Plant hormone:

👉 (d) Cytokinin

2. Gap between two neurons:

👉 (b) Synapse

3. Brain is responsible for:

👉 (d) All of the above

LONG / DESCRIPTIVE ANSWERS

4. Function of receptors

Receptors:

- Detect stimuli (heat, light, smell, etc.)
- Send signals to the nervous system
 - 👉 If receptors fail:
- Cannot feel pain → injury risk
- Cannot see/hear → sensory problems

5. Structure of Neuron + Function

Parts:

- Dendrite → receives signal
- Cell body → processes
- Axon → sends signal

Function:

- 👉 Transmits electrical impulses in the body

6. How does phototropism occur in plants?

- Light falls from one side
- Hormone **auxin** moves to shady side
- Cells grow more on that side
 - 👉 Plant bends towards light

7. Signals disrupted in spinal cord injury

- Communication between brain and body stops
 - 👉 Results:
- Loss of movement
- Loss of sensation

8. Chemical coordination in plants

Plants use **hormones (like auxin)** for coordination.

These hormones:

- Control growth
- Help respond to stimuli

9. Need for control and coordination

It is needed to:

- Respond to environment
- Maintain balance in body
- Ensure survival

10. Difference: Reflex vs Involuntary Actions

| Reflex Action | Involuntary Action |
|--------------------------|--------------------|
| Very fast | Relatively slow |
| Immediate response | Continuous process |
| Spinal cord | Brain |
| Example: hand withdrawal | Example: heartbeat |

11. Nervous vs Hormonal Control

| Nervous System | Hormonal System |
|--------------------|------------------|
| Fast | Slow |
| Electrical signals | Chemical signals |
| Short duration | Long-lasting |
| Specific | Widespread |

12. Sensitive Plant vs Human Leg Movement

| Sensitive Plant | Human Leg |
|--------------------------|--------------------------------|
| No nerves/muscles | Has nerves & muscles |
| Movement by water change | Movement by muscle contraction |
| Slow/limited | Fast and controlled |

FINAL EXAM TIP

👉 If you remember these 5 lines, you can answer most questions:

- Stimulus → Response
- Neuron carries impulse
- Reflex = spinal cord
- Brain = control center
- Hormones = chemical coordination