CONTROL & COORDINATION

- Nervous system
  - central Nervous system
    - Brain
    - Spinal cord
  - Peripheral nervous system
- endocrine system
  - 1. Spinal nerve.
  - 2. Cranial nerve.
  - 3. Visceral nerve.

STIMULUS: is the change, factor or agent in an internal or external environment which causes a change in activity or behaviour of an organism.

RESPONSE: is the reaction towards a stimulus by an organism.

RECEPTORS

These are special tips of some nerve cells that detect information from the environment. These are located in our sense organs.

- Photo receptor (sight)
- Olfactory receptor (smell)
- Thermo receptor (heat/cold)
- Phono receptor (hearing)
- gustatory receptor (taste)

EFFECTORS

effectors are tissue, glands or muscles which act in response to stimulus recieved from the nervous system.

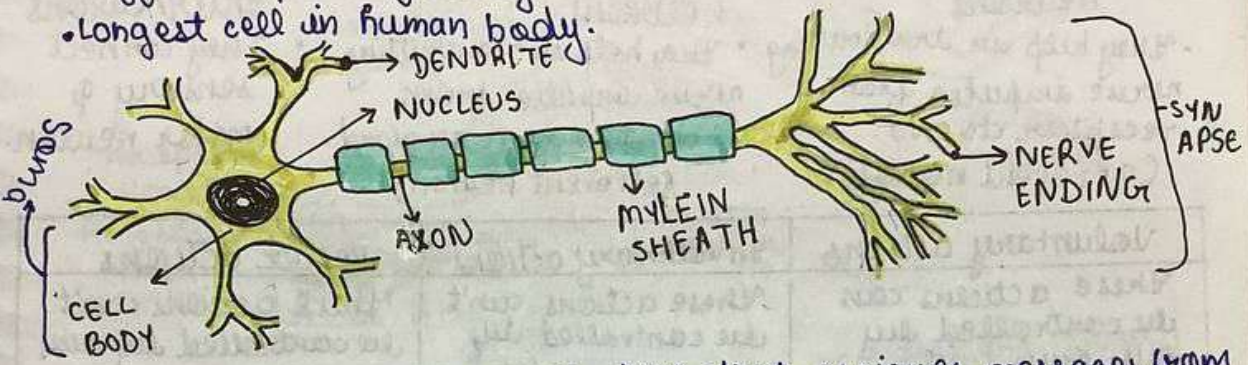
Neuromuscular junction:
connection between the terminal end of motor nerve and muscle.

HUMAN NERVOUS SYSTEM

- central nervous system (CNS)
  - Brain
  - spinal cord
- Peripheral nervous system (PNS)
  - main
    - 1. Spinal nerves
    - 2. cranial nerves

neurons: Structural and functional unit of nervous system.

- neurons are highly specialized cells.
- Responsible for the transmission of signals to and fro to different parts of body.
- Longest cell in human body.



- Dendrites: branch like structure that recieves messages from other neurons and allow transmission of message to cell body.
- Cell body/cyton: each neuron has cell body with nucleus, ER etc.
- Axon: It is long tube like structure that carries information from the cell body to nerve ending.
- Synapse: There is a gap between the end of one neuron and the dendrite of next neuron where signals are transmitted through chemical signals called neurotransmitters.

Q. How is information transferred?

Information is collected by DENDRITIC TIP.
↓
the chemical reaction sets off an ELECTRIC IMPULSE.
↓
electric impulses pass from the dendrite to CELL BODY.
↓
Then it passes from the cell body through AXON.
↓
It reaches the nerve endings at the end of the axon.

⇒ The electric impulse sets off signals called NEUROTRANSMITTERS across the SYNAPSE.

This again passes an electric signal in the next dendrite and so on.

Types of Neuron.

Sensory neurons
- They help in transmitting nerve impulse from receptor to CNS. (afferent neuron)

Motor neurons
- They help in transmitting nerve impulse from CNS to muscle or gland. (efferent neuron)

Relay neurons / Interneurons
- They connect sensory & motor neuron.

Voluntary actions	Involuntary actions	Reflex actions
These actions can be controlled by our own will.	These actions can't be controlled by our own will.	These actions can't be controlled by our own will.
Thinking is involved	Thinking is not involved.	Thinking is not involved.
Brain is involved	Brain is involved	spinal cord is involved.

REFLEX ACTION:

A reflex action is a sudden and involuntary response to a stimulus from the environment which occurs without conscious thought or control.

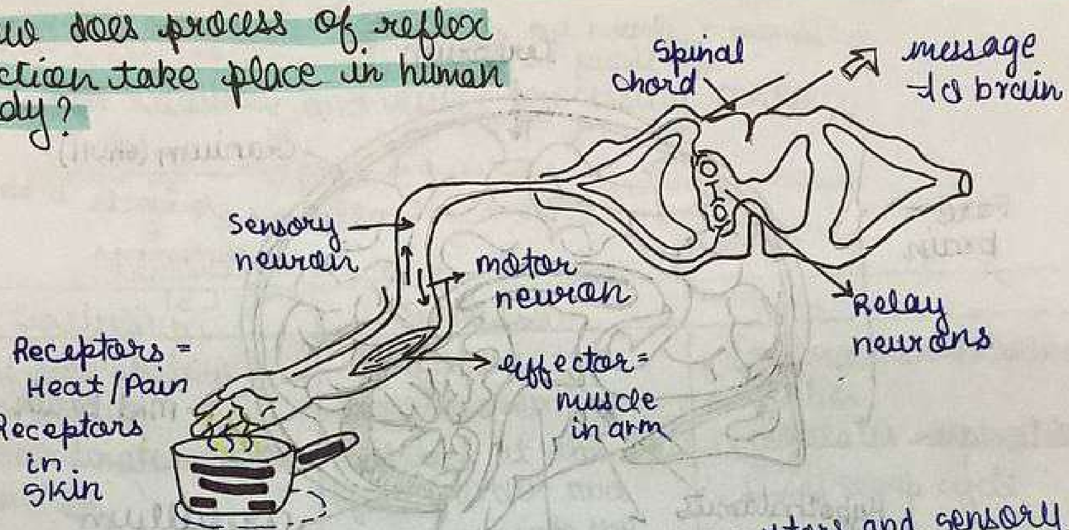
→ located in spinal chord for quick action.

Involuntary action	Reflex action
1. Involuntary actions are those that do not require thinking	1. Reflex action is an immediate response to a stimulus.
2. no stimulus required	2. stimulus is required.
3. Involves the brain.	3. Does not involve brain.
4. controlled by brain.	4. controlled by spinal cord.
5. Slow process	5. Fast process.

Reflex arc:

* Stimulus → Receptor → sensory neuron → relay neuron → motor neurons → effector → response

How does process of reflex action take place in human body?

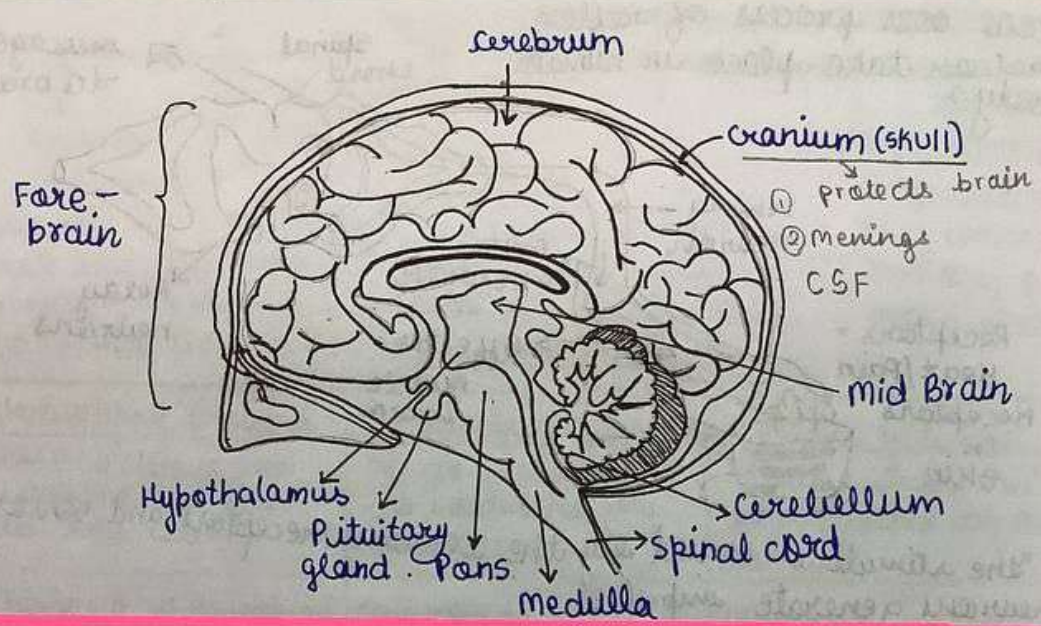


* The stimuli is sensed by the sensory receptors and sensory neurons generate impulses
* These impulses reach spinal cord
* The relay neuron in the spinal chord passes signal between neuron.
* The motor neuron pass the signals for response to the organ that needs to respond.

★ Role of Brain in Reflex action:
→ no direct involvement.
→ The brain helps to record the event and remember it for future.

★ Reflex arc
The pathway through which nerve impulse pass during reflex action is called Reflex arc.

→ a reflex arc is a simple connection between sensory and motor nerves that allows for quick responses to stimuli by passing the brain.
→ It is formed in the spinal cord, where nerves from different parts of body meet, enabling an immediate and effective reaction to environmental changes without the need of conscious thought.



~ BRAIN ~

- Forebrain
- midbrain
- Hindbrain

FOREBRAIN:

→ Cerebrum (largest part)
↓ → Thalamus
Hypothalamus → Hunger, body temprature.

→ It mainly consist of cerebrum.
↓
is the thinking part of brain.

→ site of learning, reasoning, intelligence, personality and memory.

→ It also controls thoughts, sensations, actions and movement.

→ Information from sense organs is recieved in cerebrum.

*→ It also has motor area from which instructions are sent to muscles to do voluntary actions.

★ CEREBRUM:
- arithematic and logical unit.
- largest part of brain.
- speech centre, judgement centre, thinking and emotional centre

★ HYPOTHALAMUS:
- temprature
- hunger
- thirst
- Hormone secretion

MIDBRAIN:

→ controls eye muscle movement, change in pupil size.

→ it has auditory and visual processing centre.

HINBRAIN:

→ pons → Respiration

↳ medulla → BP, vomiting, involuntary action

↓ cerebellum → balance

PCM

Cerebellum:	Medulla:	Pons:
• it lies below cerebrum • coordinates motor function. • controls posture and balance. • voluntary activities	• It forms the brain stem. • it lies at the base of the brain and continues into the spinal cord. • controls involuntary activities	• controls involuntary activities. • regulates respiration • sleep cycle • heartbeat

SPINAL CORD:

- it is located at the backside of our body.
- it connects brain to lower back portion.
- it coordinates in transport of nerve signals.
- it is responsible for all reflex actions in our body.

— CNS PROTECTION —

Brain:
- it is protected by cranium/skull.
- (CSF) Cerebrospinal fluid helps in shock absorption.

Spinal cord:
- it is proted by vertebral column → provides shape to body.

COORDINATION IN PLANTS:

- The plants do not have a nervous system and sense organs like animals.
- The plants coordinate their behaviour against environmental changes by using hormones.

Response in plants.

→ Tropic movement (related to growth)

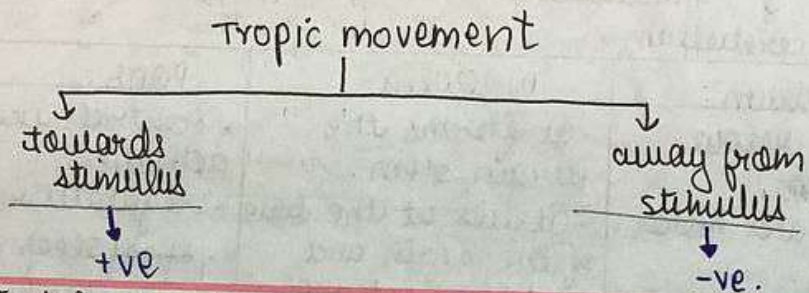
← Nastic movement (not related to growth)

Thigmonasty → mimosa pudica

→ Photonasty: dandelion

TROPIC MOVEMENTS :-

- a growth movement of a plant part in ~~response~~ response to an external stimulus in which the direction of stimulus determines the direction of response is called Tropism.



① Hydrotropism : movement of part of plant in response to H_2O. eg: Roots.

② Geotropism : upward & downward growth of shoots in response to gravity.

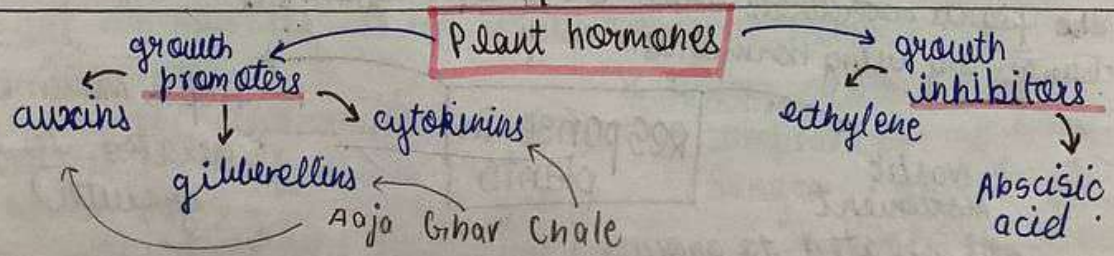
③ Chemotropism : in response to chemical. Eg : growth of pollen-tube.

④ Heliotropism : phenomenon of flower-heads following sun across sky as it moves from east to west. Eg : sunflower.

⑤ Thigmotropism : growth of plants in response to touch. Eg : tendrils.

⑥ Phototropism : growth in plt in response to light.

TROPIC MOVEMENT	NASTIC MOVEMENT
• Unidirectional response to the stimulus.	• Non directional response to stimulus
• growth dependent movements	• growth independent movement.
• more or less permanent & irreversible.	• Temporary and reversible.
• Found in all plants	• Found in few plants.
• Slow action	• Fast action.



1] Auxin:
- promotes cell elongation.
- delay fall of leaves.
- induce formation of parthenocarpic.
- speeds up growth in shoot but slows down growth in roots.

2] Gibberelins
- help in stem elongation
- breaks dormancy.
- induces parthenocarpic

3] Cytokinins
- stimulates cell division.
- stimulates cell enlargement.
- prevent ageing of plants.
- induces fruit ripening. • cell division

4] ethylene [buri sangati, banana Kharab ho jata h toh hata dete hai]
- induces fruit ripening (mango)
- promotes senescence

5] Abscisic acid [stress hormones]
- induces domancy
- stimulates closing of stomata
- inhibits seed-germinating.

HUMAN HORMONES:

- a gland is a structure which secretes a specific substance in the body.
→ a gland is made up of group of cells or tissues

ENDOCRINE	EXOCRINE
• ducts are absent • secretes hormones • secretion are poured directly in blood. Eg: Pituitary gland, thyroid, pancreas, adrenal gland etc	• ducts are present. • secretes enzymes • secretion are transported to the target through duct. • Eg: sebaceous glands, salivary glands.

name of gland	Hormone secreted	Function
1. Pituitary gland Pea shaped base of brain	i) growth hormone ii) Prolactin iii) Thyroid stimulating iv) Follicle stimulating v) Oxytocin ~~vi) Thyroxin~~.	i) body growth ii) Promotes lactation iii) stimulates thyroxin secretion. iv) growth of follicle v) contraction of uterine muscles. ~~vi) Promotes tissue and metabolism growth~~.

name of gland	hormone secreted	Function
2. Thyroid Butterfly shaped	i] Thyroxine	i] Promotes tissue metabolism, growth and differentiation.
3. Adrenal gland (medulla) above each kidney	i] adrenaline	i] causes stimulation of sympathetic nervous system ii] prepares body for emergency.
4. Pancreas [Islets of Langerhans] Leaf like behind stomach, in abdomen i] α cells ii] β cells iii] delta cells	Endocrine i] insulin ii] glucagon iii] somatostatin	i] lowers blood sugar level ii] raises blood sugar level iii] control secretion of insulin & glucagon.
5. Testes (present in scrotum)	i] Testosterone	i] controls growth and development of male reproductive system.
6. Ovaries	i] oestrogen, Progesterone	• controls growth and development of female reproductive system
7. Thymus (lower neck/ upper chest)	Thymus hormone	develops immunity in kids.

feedback mechanism : ability of gland to control the secretion of hormones.