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Ch-6

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Control and Coordination

Topics Covered:-

→ Human Nervous System
→ Endocrine System
→ Plants: Movement and Hormones.

-o- Human Nervous System

- Central Nervous System (CNS)
  - Brain
  - Spinal Cord
- Peripheral Nervous System (PNS)
  - Consits Collection of Nerves

-o- Peripheral Nervous System:-

→ Spinal Nerves arise from the Spinal Cord along most to the length of the spinal cord and spread throughout the body (except head).

→ Cranial Nerves arise from the brain and spread throughout the head. They carry both sensory and motor neurons.

→ The visceral Nerves → Arise → Spinal Cord. (Both Motor and Sensory.)
↘ Further connected to internal organs

Terms Related to Central Nervous System :-

→ Stimuli / Stimulus :- Factor which bring response
↘
e.g. - Heat, Pain, Cold, Smell, Vision etc.

→ Receptor :- Cell or a group of cell that detect the charge of stimuli

Tounge ↑
- Gustatory Receptors
↓
Help us to taste

Ear
- Phonoreceptors
↓
Help us to Hear

eye
- Photoreceptors
↓
Help us to see

Nose
- Olfactory Receptors
↓
Help us to smell

Skin → Thermoreceptors → help us to feel

→ Effector :- Part of the body which respond to stimulus → Instructed from Nervous system (Brain, Spinal Cord)
↙
e.g. - Muscles, Glands

→ Respond :- Reaction of Effector

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Q- Neurons

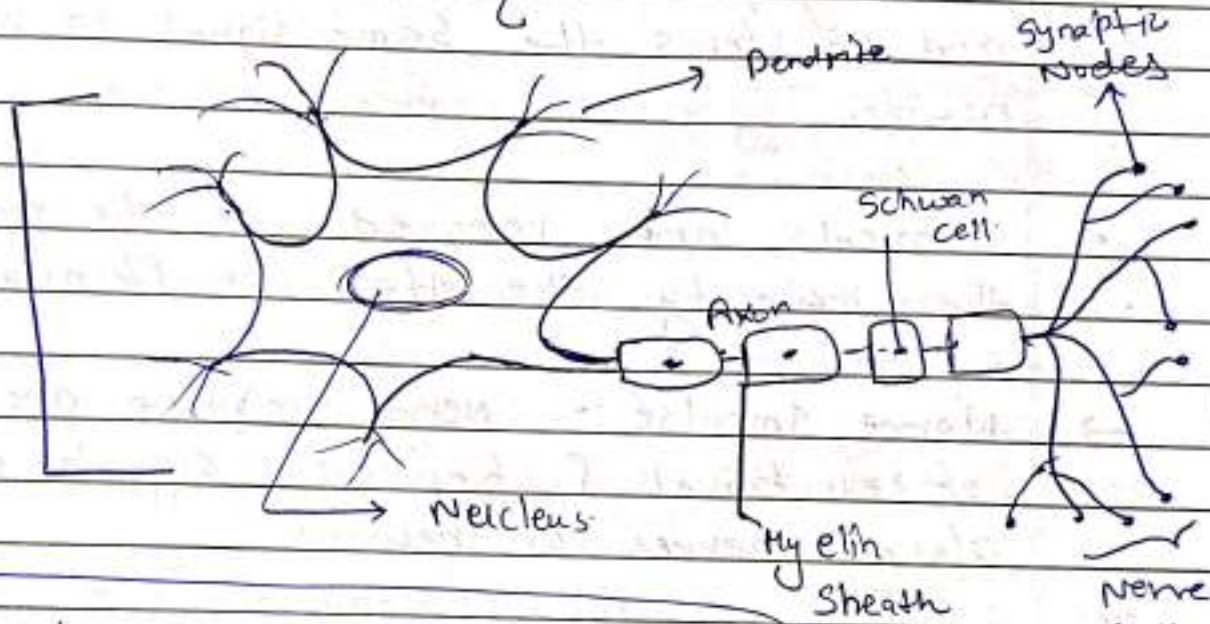
→ Structural and functional unit of Nervous system.

→ Highly Specialised Cell

→ largest Cell → Human body

→ Responsible for the transmission of signals to different parts of body.

Q- Structure of the Neurons :-



1.) Dendrites :- acquires information and receive impulse from other neurons

2.) Cell Body :- Convert → Chemical Signals → Electrical Signals

3.) Axon :-

↓

→ longest fibre on the cell body

Transmitt electrical impulse from cell body to dendrite of next neuron.

→ Functions of Neuron :-

- Information or signals from receptors acquired at the end of dendritic tip of nerve cell as chemical reaction that creates an electric impulse.
- Impulse travels from the dendrite to the cell body and then at the end of the axon.
- there is a gap between two neurons called synapse. these chemicals cross the gap and transfer's the same signal to next neuron.
- Chemicals are released at the end of the axon by the effect of electrical impulse.

→ Nerve Impulse :- Nerve impulse are wave of electrical & chemical signals carried along nerves or neurons.

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-o- Types of Neurons:-

Sensory neurons

Motor Neurons

Interneurons

Relay Neurons

Sensory Neurons

Stimulus → Receptors → CNS

CNS → Motor Neurons

Effector → Response

→ Neuromuscular Junction :-

Synaptic Connection between terminal of end of Motor Nerves and Effectors

Muscles Glands

→ Voluntary Actions:- Actions controlled by our own will

→ Involuntary Actions:- Actions cannot controlled by our own will.

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Brain :—

- Highest coordinating centre in the body
- located inside the skull
- Protected by a box called Cranium
- Brain is surrounded by 3 membranes. called meninges
- the space between the membranes is filled with cerebra ~~sft~~ spinal fluid

Prevents brain from mechnical shocks

Regions of Brain

- Fore Brain
- Mid Brain
- Hind Brain

Fore brain

- Hypothalamus
- Thalamus
- Cerebrum → largest Part

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- Cerebrum :-

1.) Frontal lobe → Receives memory, reasoning, learning)

2.) Temporal lobe → Receives sense of smell & hearing helps understanding speech.

3.) Parietal lobe → Receives sense of pain, touch, temperature, Pressure, Gustatory area receives sense of taste.

4.) Occipital lobe :- Visual area receives impulses from eye through optic nerve.

- Thalamus :- Connection of cerebrum and hypothalamus.
- Hypothalamus :- → Regulates secretion of Hormones from Pituatry gland
  → lies at the base of the cerebrum
  ↓ Releases Hormones
  ↓ Controls sleep & wake cycle of the body.

- Hind Brain
  - Pons
  - Medula
  - Cerebellum

→ Cerebellum → below cerebrum

↓ Coordinates Motor functions

Controls posture & balance

Controls voluntary activities.

→ Medulla → forms the brain stem

↓ lies at the base of brain

Continues to SC.

Controls Involuntary actions

↓

heart beating, Hearing, Respiration.

→ Pons: → Regulates Respirations

↓

Also controls respiration

-ó- Spinal Cord: → Cylindrical Structure

↓ Part of CNS.

↓ 31 pairs of nerves arise from Spinal Cord

↓ Enclosed in a bony case called vetebral columns.

↓ wrapped with Cerebro Spinal fluid.

↓ Helps in conduction of nerve impulses to and from the brain.

→ Controlled by Spinal cord

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Q- Reflex Action :- Sudden Reaction due to Stimulus

→ Reflex Arc :- the path way through which nerve impulses pass during reflex action is called Reflex arc.

Heat (Stimulus) → Receptors (Skin) → Spinal Organs → Effector Organ (Muscle)

Respond ←

message of Reflex Action reaches brain which stored events for future use.

→ Need for Reflex actions :-

- In a situations like touching hot, objects, pinching etc.
- Generated from Spinal Cord instead of Brain
- So the time taken for the action is reduced.

-6-

Glands :- Structure which secretes a specific substance (or substances) in the body.

Made up of group of cells or tissue

Glands

- **Exocrine** → does not release Hormone → Saliva, Tears
- **Endocrine** → Release Hormone → Pituatry, Testes, Ovary

→ **Pituatry Gland :-** → Pituatry gland is present just below the brain

- growth hormone Secrete ~~Pitu~~ growth hormone.
- Controls the growth of human body e.g.- development of bones & muscles.

→ **Thymoid Gland :-** → Attached to wind pipe

↓

Secrete thytoxin (contains iodine)

Thyroxin Controls rate of metabolism of Carbohydrates, Fats and proteins in the body

Formed by Iodine

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- If thyroxine hormone is not released led to Goitre

→ Parathyroid Gland :- → secrete Parathormone
↓
Regulate Calcium & phosphate levels in the blood.

→ Thymus Gland :- → lies in the lower part of neck and upper part of chest
↓
secretes thymus hormone
↓
role in the development of the immune system of the body

↓
It is large in young children but shrinks after puberty (or sexual maturity).

→ Pancreas → Just below the stomach in the body
↙ ↘
Exocrine Endocrine
↓ ↓
Pancreatic Juice - Trypsin, Lipase etc
Insulin hormone
↓
decrease
Glucagon ~~increase~~ regulates blood Sugar level
↓
Decrease blood sugar level

→ Adrenal glands :- present on the top of two kidneys

↓

Secrete adrenaline hormone

Regulate heart rate, breathing rate blood pressure and Carbohydrate metabolism

Also called "Glands of Emergency".

→ Testes :- only present in males (men)

↓

Make sex hormones called testosterone.

Form male gametes called Sperms.

→ Ovaries :- Only present in female (women)

↓

Secrete female sex hormone, Estrogen & Progesterone

↓

Development of female sex organs

-ǫ- Feedback Mechanism:-

↓

The excess or deficiency of hormones has a harmful effect on our body

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Eg — Sugar level in the blood rises
↓
Detected by cells of Pancreas
↓
Synthesis of Insulin
↓
Blood Sugar level falls
↓
Stop secreting more Insulin.

Q. Control and Coordination in Plants :-

- Movements
- Hormones

→ Response in plants

- Not Related To Growth
  ↓
  Touch me Not Plants.
  ↓
  Nastic Movement
- Related to Growth
  ↓
  Root and shoot growing downward & upward respectively
  ↓
  Tropic Movements

→

	Tropic	Nastic
i)	Unidirectional response to the stimulus.	i) Non-directional response to stimulus.
ii)	Growth dependent movements	ii) Growth independent movements.
iii)	More or less permanent and irreversible	iii) Temporary and reversible
iv)	Found in all plants.	iv) Found only in a few specialized plants.
v)	Slow action	v) Immediate action

- Types of Tropisms
  - ⊕ → plant grows towards the stimulus.
  - ⊖ → Plant grows away from the stimulus.

1) Phototropism → a plant part moves towards the light → Positive tropism

Movement of plant part in response to light is called Phototropism

2) Geotropism :

the movement of plant part in response to gravity is called geotropism

→ If plant part moves away the gravity → Negative geotropism

→ If Plant parts moves towards the Gravity → Positive geotropism

3) Chemotropism

the movement of plant part in response to a chemical stimulus is called Chemotropism.

→ If plant parts moves towards the Chemical Stimulus → Positive Chemotropism

4) Hydrotropism :

the movement of plant part in response to water is called hydrotropism

→ If plant parts moves towards the water → Positive hydrotropism

5.) Thigmotropism

The directional growth movement of a plant part in response to the touch of an object is called thigmotropism

- Types of Nastic Movement

1.) Thigmonasty → e.g. - Touch me not or Chuimui Plant

The non-directional movement of a plant part in response to the touch of an object is called thigmonasty

2.) Photonasty → Opening & Closing of flowers in response to light

The non-directional movement of a plant part (usually petals of flowers) in response to light is called photonasty.

~~are growth~~ movements

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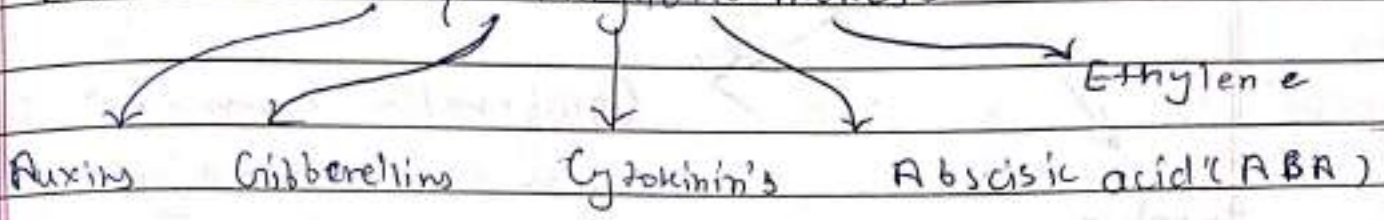
-o- Plant Hormones {Phytohormones}



:- Functions of these Hormones

	Germination	Growth To Maturity	Flowering	Fruit Development	Abcission	Seed Dormancy
Gibberelin	✓	✓	✓	✓	✗	✗
Auxin	✗	✓	✓	✓	✗	✗
Cytokinins	✗	✓	✓	✓	✗	✗
Ethylene	✗	✗	✓	✓	✓	✗
Abscisic Acid	✗	✗	✗	✗	✓	✓

→ Gibberellins :

Gibberellin hormone is involved mainly in shoot extensions.

Involves in Germinating seeds in plants

→ Cytokinin's :

Plant's hormones which promote cell division in plants

Cytokinin's promote the opening of stomata, the also promote fruit growth

→ Auxin :-

Made by cells at the tip of stems & roots.

Auxin hormone controls a plant's response to light and gravity

Promote cell enlargement & cell differentiation in plants. Auxins also promote fruit growth

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→ Ethylene

↓

Ripening of fruits

The END...