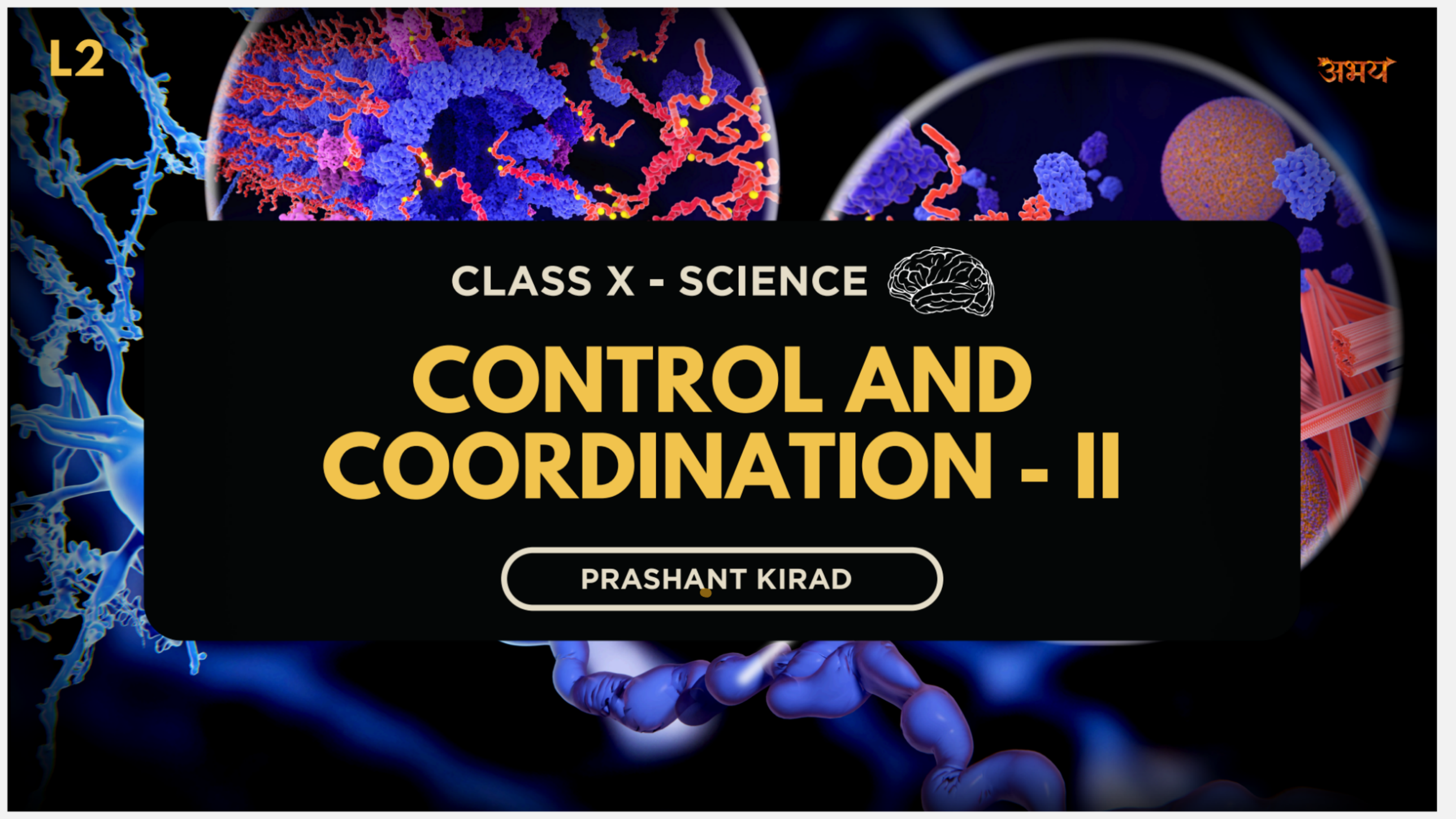
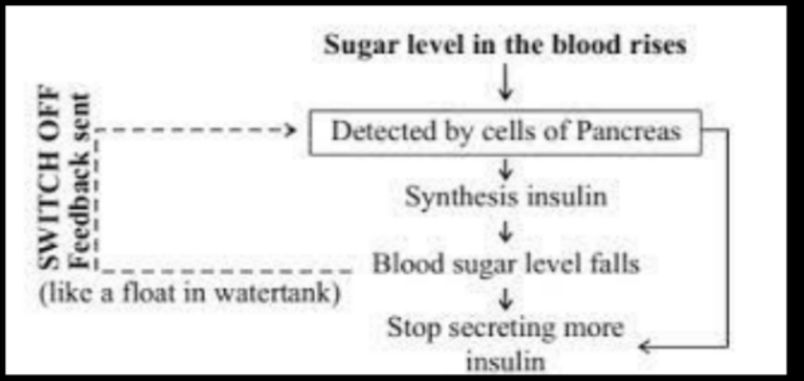

L2
अभय
CLASS X - SCIENCE
CONTROL AND COORDINATION - II
PRASHANT KIRAD

FEEDBACK MECHANISM

अभय

Hormonal Imbalance: Excess or deficiency of hormones harms the body. *Example: Insufficient insulin causes diabetes, while excess insulin may lead to coma.*

Feedback Mechanism: Controls hormone release timing and amount.
Example: High blood sugar triggers the pancreas to release insulin. Once sugar levels normalize, insulin production decreases automatically.



CONTROL AND COORDINATION IN PLANTS

अभय

Plants' Coordination: Plants lack a nervous system and sense organs but still respond to their environment.

Role of Hormones: They use hormones to coordinate responses to environmental changes.

TYPES OF MOVEMENTS IN PLANTS

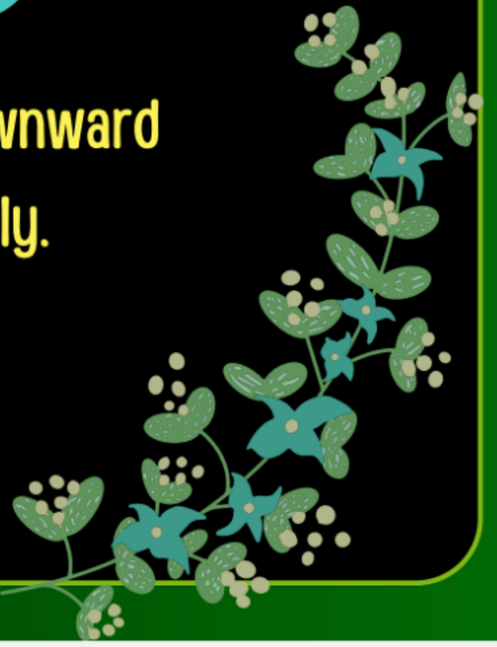
अभय

Nastic movement

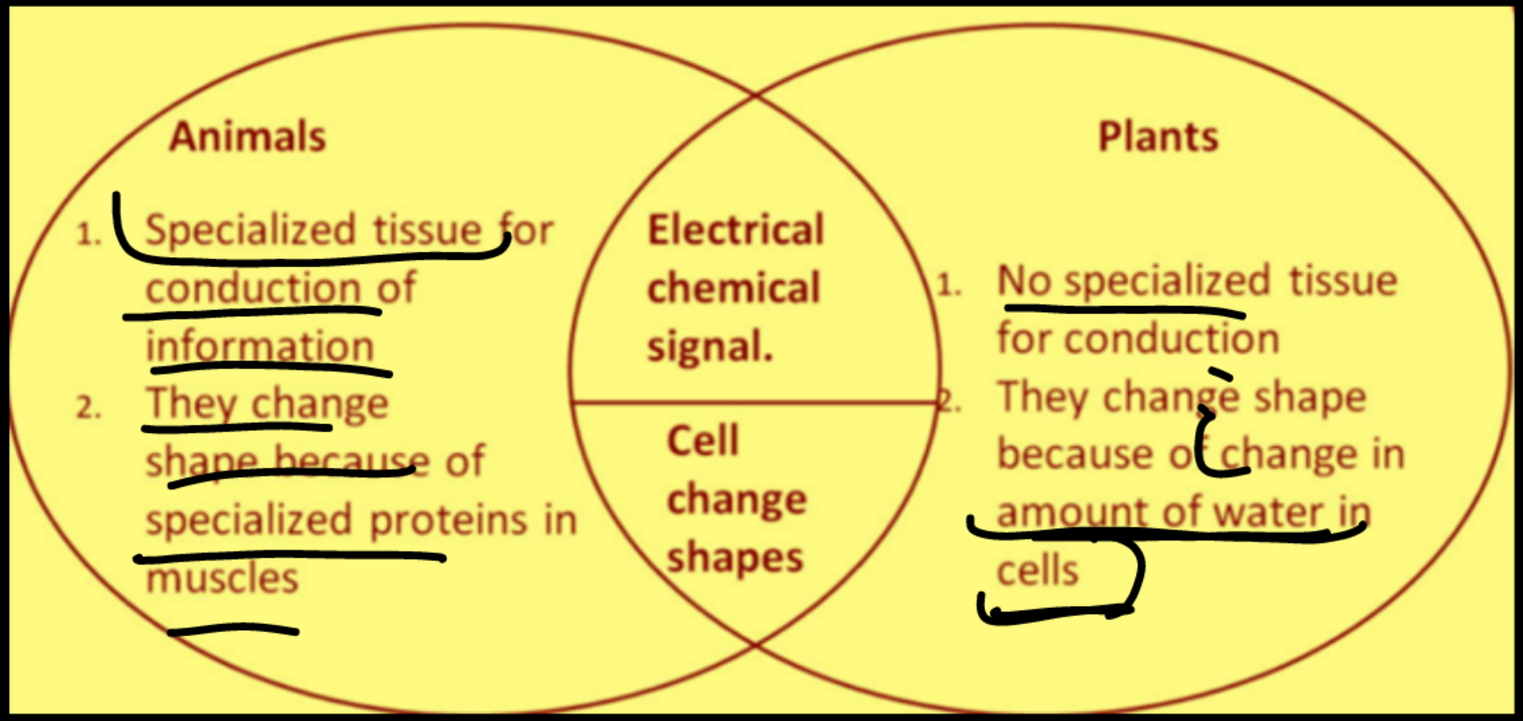
Leaves of touch-me-not (chui-mui) plant drooping on touching

Tropic movement

Root and shoot growing downward and upward respectively.



RESPONSE TO STIMULUS IN ANIMALS V/S PLANTS



TROPISMS (TROPIC MOVEMENTS)

अभय

Tropism: It is the directional growth movement of a plant part in response to an external stimulus.

- **Positive Tropism:** When a plant part grows or moves towards the stimulus, *such as roots growing towards water or stems growing towards light.*
- **Negative Tropism:** When a plant part grows or moves away from the stimulus, *like roots growing away from light.*

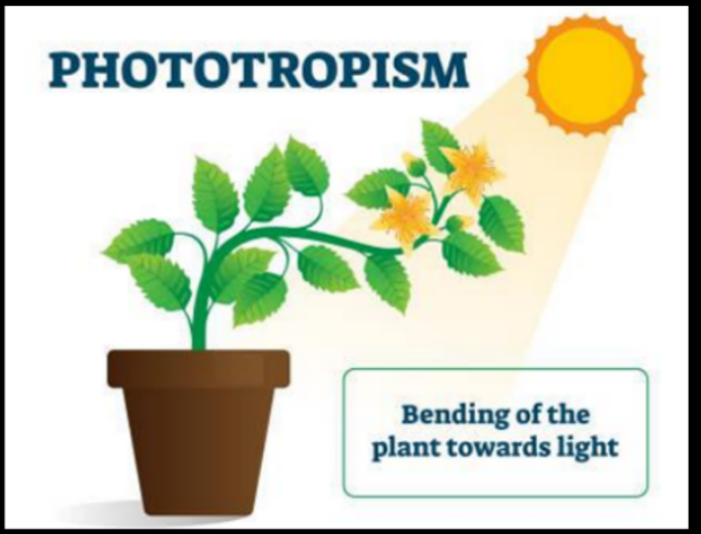
TYPES OF TROPISM

अभय

Sunlight

Phototropism

- *The movement of a plant part in response to light is called phototropism.*
- If the plant part moves towards light, it is called positive phototropism.
- On the other hand, if the plant part moves away from light, then it is called negative phototropism.



- **Positive Phototropism: The plant's stem grows toward light.**
- **Negative Phototropism: The plant's roots grow away from light.**

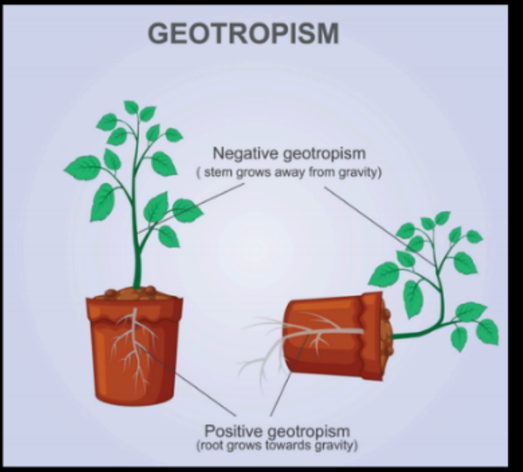
TYPES OF TROPISM

अभय

Geotropism

- *Movement of a plant part in response to gravity.*

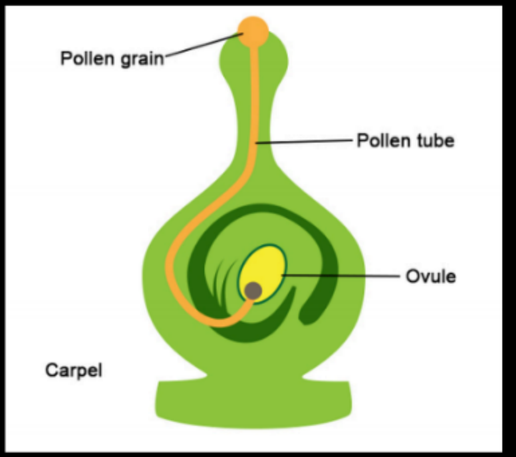
- Positive Geotropism: Plant part grows toward gravity (e.g., roots).
- Negative Geotropism: Plant part grows against gravity (e.g., stem).



Chemotropism

- *Movement of a plant part in response to chemical stimulus.*

- Positive Chemotropism: Growth toward the chemical (e.g., pollen tube growing towards ovules).
- Negative Chemotropism: Growth away from the chemical.



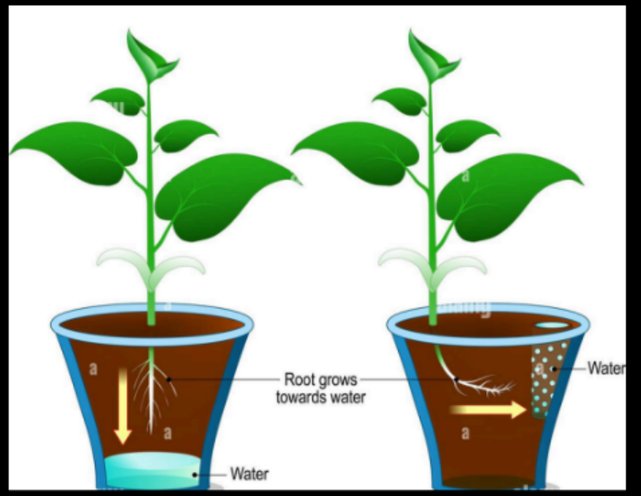
TYPES OF TROPISM

अभय

Hydrotropism

- *Movement of a plant part in response to water.*

- **Positive Hydrotropism: Plant part moves towards water,**
- **Negative Hydrotropism: Plant part moves away from water,**



Touch

Thigmotropism

- *Directional growth of a plant part in response to touch.*
- ***Positive Thigmotropism:*** *Climbing parts like tendrils grow toward and wind around a support they touch.*

NASTIES (NASTIC MOVEMENTS)

अभय

Nastic Movement: Movement of a plant part in response to a stimulus, where the direction of response is independent of the stimulus's direction.

Example: The folding of Mimosa pudica (sensitive plant) leaves when touched.

NASTIES (NASTIC MOVEMENTS)

अभय

- **Dandelion Flowers:** Petals open in bright morning light and close in the evening when light fades.

- **Moonflower:** Petals close in bright light and open in the dark as light diminishes.

- **In both cases, the stimulus is light, but the response direction is independent of the light's direction.**

THIGMONASTY

अभय

The non-directional movement of plant parts in response to touch.

Example: Sensitive plant (Mimosa pudica), also known as "touch-me-not" when touched, the leaves fold and droop almost immediately.

- This occurs due to a sudden loss of water from pad-like swellings called pulvini at the base of the leaves, causing them to lose firmness and droop.

PHOTONASTY

अभय

The non-directional movement of plant parts, typically flower petals, in response to light.

- **Example:** Flowers open when the inner surfaces of petals grow more than the outer surfaces. Conversely, petals close when the outer surfaces grow more than the inner surfaces.

TROPISM V/S NASTIES

अभय

Tropic movements	Nastic movements
Unidirectional response to the stimulus	Non-directional response to the stimulus
Growth dependent movements	Growth independent movements
More or less permanent and Irreversible	Temporary and reversible
Found in all plants	Found only in a few specialized plants
Slow action	Immediate action

अभय

PLANT HORMONES

The control and coordination in plants is done by plant hormones (or phytohormones).

The growth of a plant can be divided into three stages:

1. Cell division
2. Cell enlargement
3. Cell differentiation (or cell specialization

TYPES OF HORMONES

- AUXIN
- GIBBERELLINS
- ABSCISIC ACID
- CYTOKININ'S

AUXIN

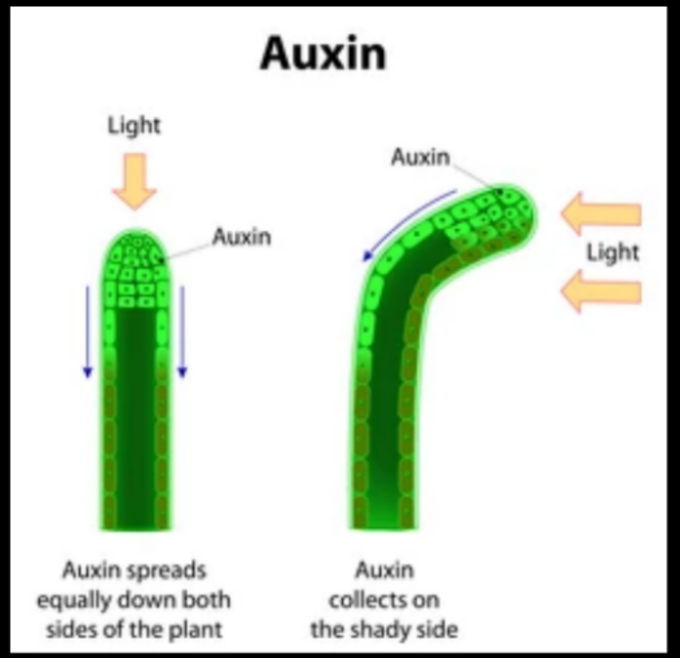
shoot
Root
(Tip)

अभय

Auxins: Plant hormones that promote cell enlargement, differentiation, and fruit growth.

Functions

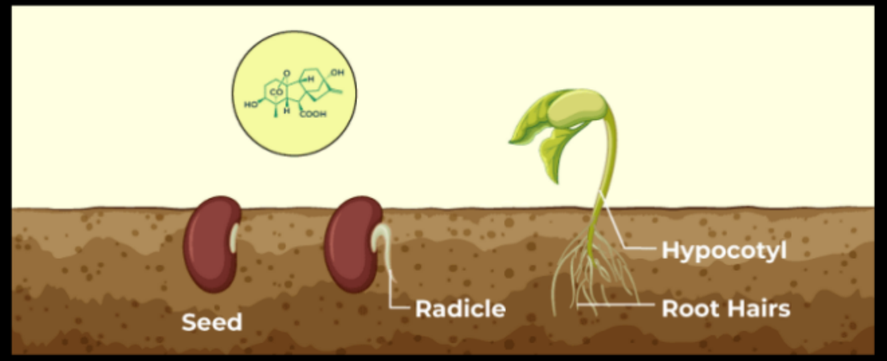
- Control plant responses to light and gravity.
- Produced at the tips of stems and roots.
- Move away from light and toward gravity.
- Stimulate growth in stems but slow growth in roots.



Application: Synthetic auxins are used in agriculture and horticulture.

GIBBERELLINS

Gibberellins: Plant hormones that promote cell enlargement and differentiation in the presence of auxins.



Functions

- Break seed and bud dormancy.
- Promote fruit growth.
- Stimulate shoot elongation and extensions.
- Aid in the elongation of plant shoots.

CYTOKININS

अभय

Cytokinins: Plant hormones that promote cell division.

Functions

- Break seed and bud dormancy.
- Delay leaf aging.
- Promote stomatal opening.
- Enhance fruit growth.

ABSCISIC ACID (ABA)

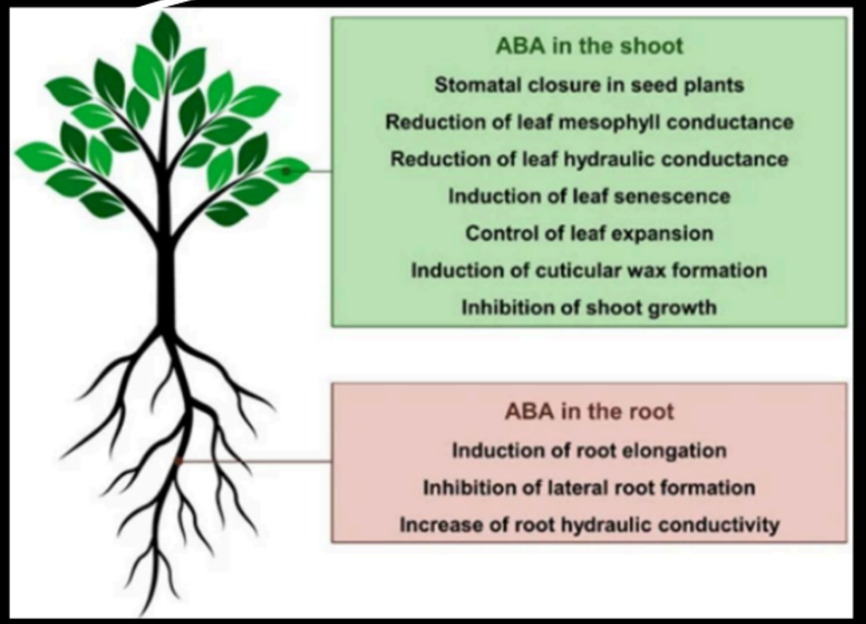
अभय

Ethylene → gas

Abscisic acid (ABA): Plant hormones that acts as a growth inhibitor.

Functions

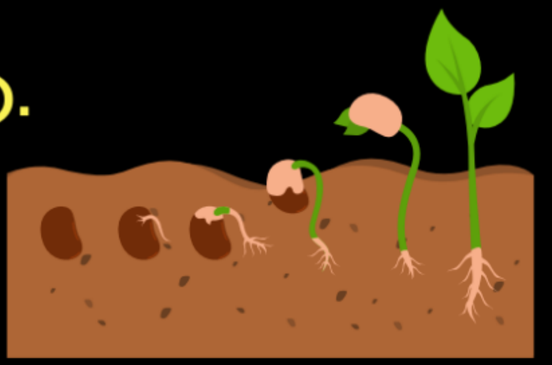
- Induces dormancy in seeds and buds.
- Promotes stomatal closure.
- Causes wilting and leaf abscission (falling of leaves).
- Facilitates detachment of flowers and fruits from plants.



FUNCTIONS OF PLANT HORMONES

अभय

- Germination of seeds (or Breaking the dormancy of seeds).
- Growth of root, stem, and leaves.
- Movement of stomata (or stomatal movement) in leaves.
- Flowering of plants
- Ripening of fruits



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Q.Which plant hormone promotes dormancy in seeds and buds?

(a) Auxin

(b) Gibberellin

(c) Cytokinin

(d) Abscisic acid

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2019/2018 (3 Marks):

Q: Explain the feedback mechanism to regulate hormone secretion with an example.

Answer:

- **A feedback mechanism ensures that the body maintains homeostasis by regulating hormone levels.**
- **Example:**
  a. **When blood sugar levels rise, the pancreas secretes insulin, which lowers blood sugar.**
  b. **Once blood sugar is normalized, the pancreas stops secreting insulin.**
  c. **Similarly, when sugar levels drop, the pancreas secretes glucagon, which raises sugar levels.**

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2024 (3 Marks):

Q: What are tropic movements? Name any two types of tropic movements in plants and give examples.

Answer:

Tropic Movements: Directional movements of plants in response to external stimuli.

Types:

(a) Phototropism: Movement towards light, e.g., sunflower bending toward sunlight.

(b) Geotropism: Movement in response to gravity, e.g., roots growing downward (positive geotropism) and shoots growing upward (negative geotropism).

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2019 (2 Marks):

Q: Why do roots grow downward and shoots grow upward?

Answer:

- Roots grow downward due to positive geotropism, responding to gravity.
- Shoots grow upward due to negative geotropism, growing away from gravity.

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2023 (2 Marks):

Q: What are nastic movements? Give an example.

Answer:

- Nastic Movements: Non-directional responses of plants to stimuli.
- Example: The folding of leaves in touch-me-not (Mimosa pudica) when touched.

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2020 (5 Marks):

Q: Describe the role of plant hormones in controlling growth and development with examples.

Answer:

- **Auxins: Promote elongation of stem cells, e.g., bending of plants toward light.**
- **Gibberellins: Stimulate stem elongation and break seed dormancy, e.g., grapes grow larger with gibberellin treatment.**
- **Cytokinins: Promote cell division, e.g., delay aging in leaves.**
- **Abscisic Acid: Inhibits growth, e.g., closing of stomata during drought.**
- **Ethylene: Promotes fruit ripening, e.g., ripening of bananas and mangoes.**

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2021 (3 Marks):

Q: What are plant hormones? Write the function of the following:

(a) Auxin

(b) Gibberellin

(c) Abscisic acid

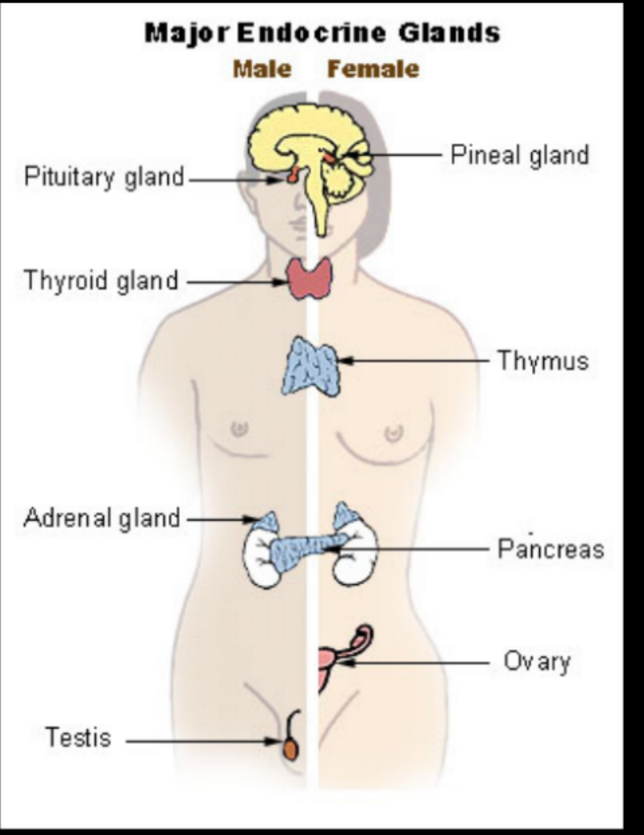
Answer:

- **Plant Hormones: Chemical substances in plants that regulate growth and other physiological processes.**
- **Functions:**
  a. **Auxin: Promotes cell elongation and helps in phototropism.**
  b. **Gibberellin: Stimulates growth in stems, flowering, and seed germination.**
  c. **Abscisic Acid: Inhibits growth and induces dormancy during unfavorable conditions.**

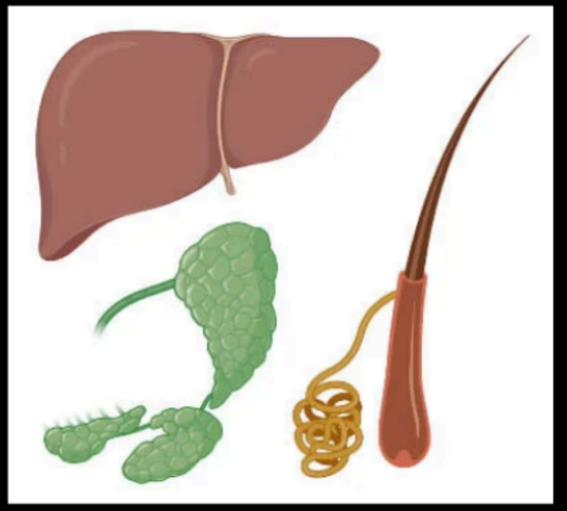
अभय

HORMONES

Hormones are **chemical messengers** secreted by endocrine glands.
They regulate various physiological processes like growth, metabolism, reproduction, and mood.
Example: Insulin controls blood sugar levels.

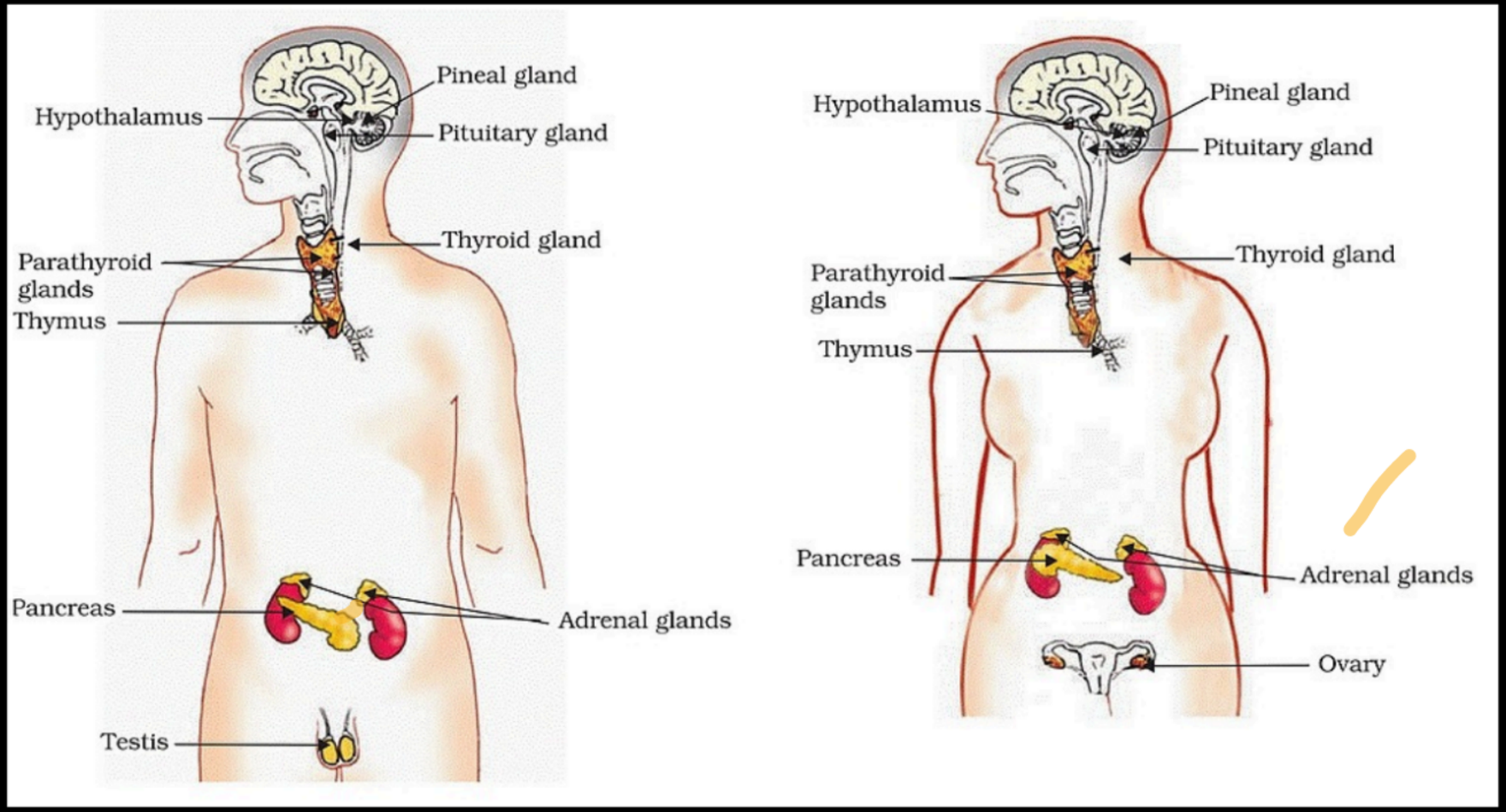


Endocrine Glands	Exocrine Glands
Ductless glands.	Have ducts.
Secrete hormones directly into the blood.	Secrete enzymes, sweat, etc., into ducts.
Example: Thyroid, Pituitary.	Example: Salivary, Sweat glands.



अभय

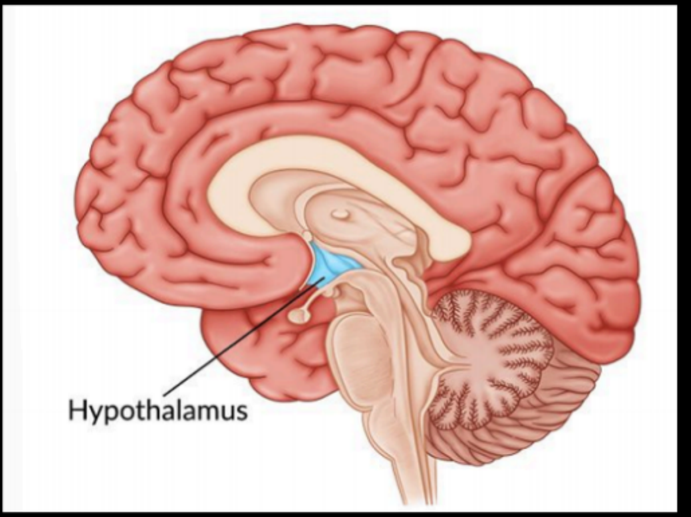
GLANDS


Hypothalamus
Pineal gland
Pituitary gland
Thyroid gland
Parathyroid glands
Thymus
Pancreas
Adrenal glands
Testis
Hypothalamus
Pineal gland
Pituitary gland
Thyroid gland
Parathyroid glands
Thymus
Pancreas
Adrenal glands
Ovary

अभय

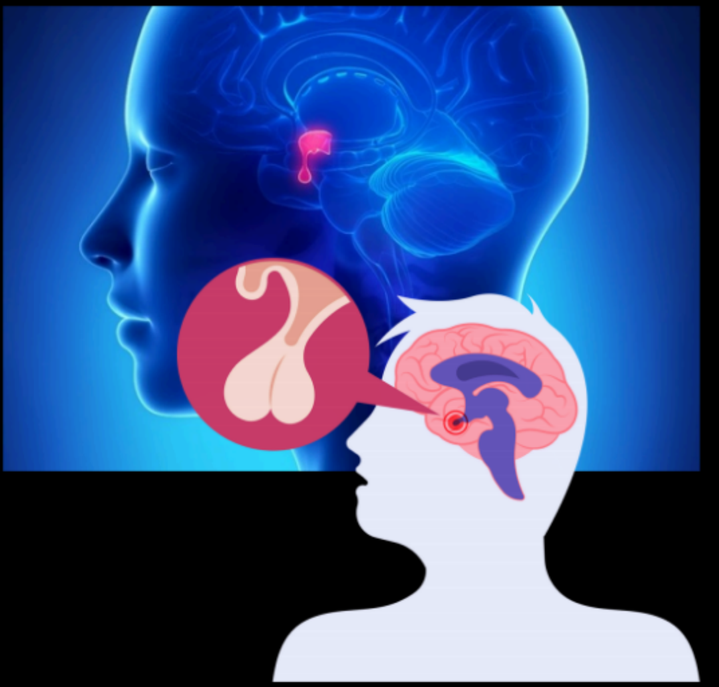
HYPOTHALAMUS

- Hypothalamus gland is present in the brain.
- primarily produces "releasing hormones" and "inhibiting hormones" that regulate the pituitary gland.
- The function of hypothalamus is to *regulate the secretions of hormones from pituitary gland.*
- That is how, hypothalamus *controls the pituitary hormones.*



PITUITARY GLAND

- Pituitary gland is **present just below the brain**.
- The pituitary gland secretes a number of hormones.
- One of the hormones secreted by pituitary gland is **growth hormone.**
- The growth hormone *controls the growth of the human body.*
- For example, growth hormone controls the development of bones and muscles



अभय

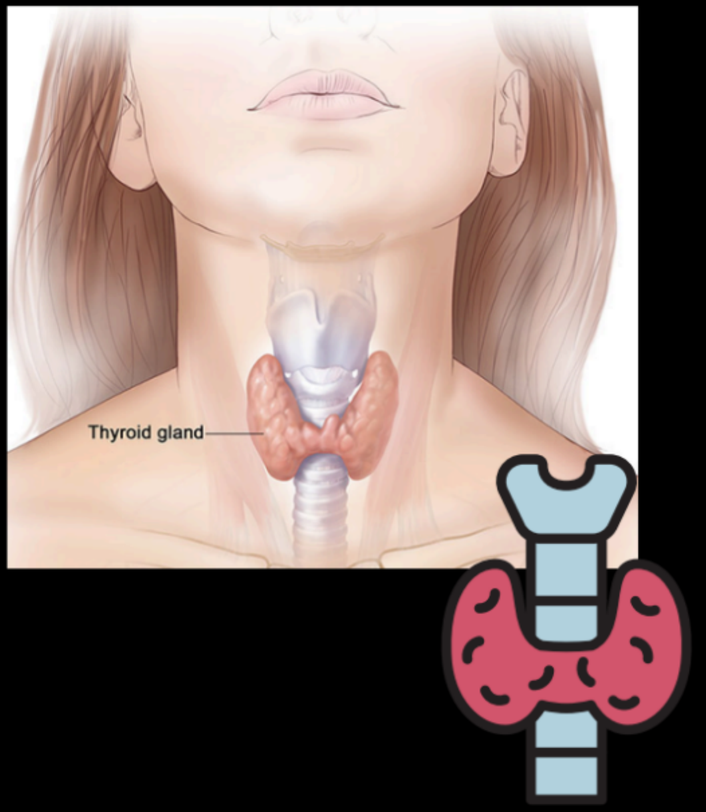
DEFICIENCY OF GROWTH HORMONE

- **Deficiency of growth hormone** during childhood causes **dwarfism**, resulting in short stature.
- **Excess growth hormone** leads to **gigantism,** making the person abnormally tall.

अभय

THYROID GLAND

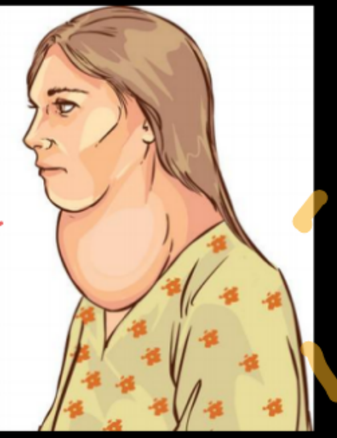
- Thyroid gland is *attached to the windpipe in our body.*
- Thyroid gland makes a hormone called **thyroxine** (which contains iodine).
- The function of thyroxine hormone is to *control the rate of metabolism of carbohydrates, fats and proteins in the body.*



अभय

GOITRE

- **Iodine is essential for producing thyroxine.**
- Its deficiency reduces thyroxine levels, causing **goitre**, a disease characterized by *neck swelling.*

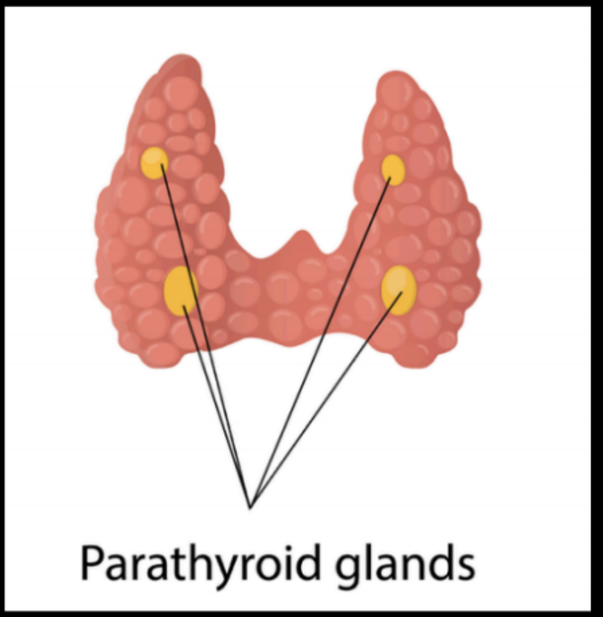


SOME IODINE RICH SOURCES

Seaweed, Fish, shellfish, Table salts labeled "iodized", Dairy (milk, cheese, yogurt), Eggs, Beef liver, Chicken.

PARATHYROID GLAND:

- There are four small parathyroid glands which are *embedded in the thyroid gland.*
- Parathyroid glands secrete a hormone called **parathormone**.
- The function of parathormone hormone is to *regulate calcium and phosphate levels in the blood.*

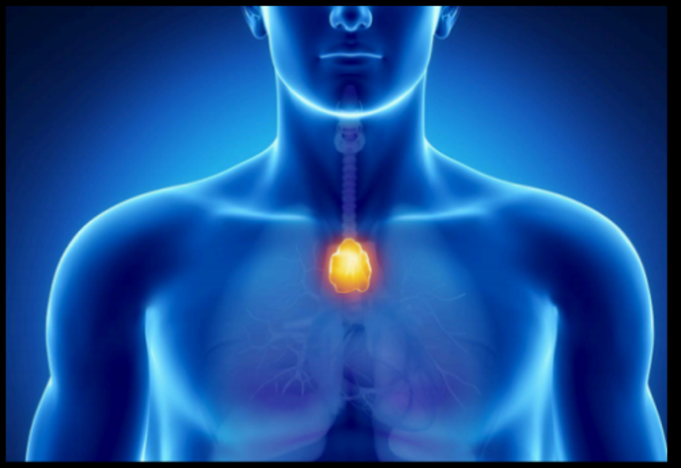


Parathyroid glands

अभय

THYMUS GLAND

- Thymus gland *lies in the lower part of the neck and upper part of chest.*
- Thymus gland secretes **thymus hormone** which plays a role in the *development of the immune system of the body.*
- Thymus gland is large in young children but shrinks after puberty.



अभय

PANCREAS

Pancreas is a mixed/dual gland i.e.

It functions as both

Exocrine glands

Pancreatic juice - Trypsin, Lipase, etc.

Endocrine glands

Hormone

अभय

PANCREAS

- The pancreas is just *below the stomach in the body.*
- Pancreas secretes the hormone called **"insulin".**
- The function of insulin hormone is to *lower the blood sugar level (or blood glucose level)*

Pancreas

- Alpha cells → Glucagon → Increase level of blood glucose (sugar) level in blood
- Beta cells → Insulin → Decrease blood glucose (sugar) level in our blood

अभय

DIABETES

- **Deficiency of insulin** hormone in the body causes a disease known as diabetes.
- Diabetes is characterized by *large quantities of sugar in the blood (and even urine).*
- The insulin hormone controls the metabolism of sugar.

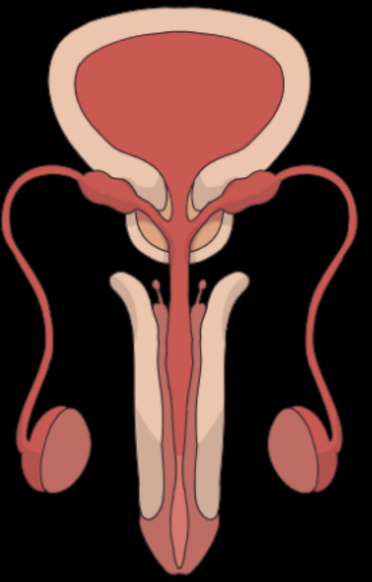
अभय

ADRENAL GLAND

- There are two adrenal glands which are *located on the top of two kidneys.*
- The adrenal glands secrete **adrenaline hormone.**
- The function of adrenaline hormone is to *regulate heart rate, breathing rate, blood pressure and carbohydrate metabolism*
- Adrenaline, secreted by the adrenal glands, prepares the body for "fight or flight" during emergencies by:
  - Increasing heartbeat and breathing rate.
  - Raising blood pressure.
  - Boosting glucose levels in the blood for quick energy.
- *This makes adrenal glands the "glands of emergency."*

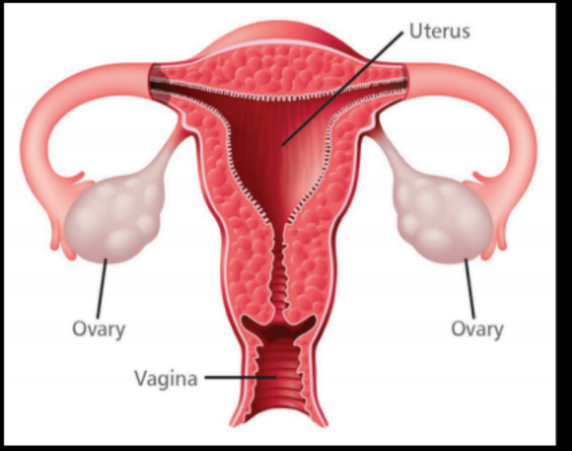
TESTES

- Testes are *male-specific glands.*
- They produce the male sex hormone **testosterone**.
- They also generate male gametes, known as *sperms*.
- Its function is to *control the development of male sex organs a*nd male features such as deeper voice, moustache, beard, and more body hair (than females).
- These changes occur during puberty, typically around ages 13–14.



OVARIES

- Ovaries are female glands producing:
  - **Oestrogen**: Develops female sex organs and traits like a soft voice, smooth skin, and breasts, typically during puberty (ages 10–12).
  - **Progesterone**: Regulates the menstrual cycle, supports pregnancy, and maintains uterine changes.
- Ovaries also produce female gametes called ova (eggs).



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Q6.A female is suffering from an irregular menstrual cycle. The doctor prescribed her some hormonal tablets. Which option shows that the hormone she lacks in her body is from the endocrine gland?

(a) Oestrogen
(b) Testosterone
(c) Adrenalin
(d) Thyroxin

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Q7. Which gland is responsible for the "fight or flight" response in humans?

(a) Pancreas

(b) Adrenal gland

(c) Thyroid gland

(d) Pituitary gland

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Q8.A diabetic patient suffers from deficiency of which hormone?

(a) Thyroxine

(b) Testosterone

(c) Oestrogen

(d) Insulin

अभय

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Q9.A gland secretes a particular hormone. The deficiency of this hormone in the body causes a particular disease in which the blood sugar level rises.
(i) Name the gland and the hormone secreted by it.
(ii) Mention the role played by this hormone.
(iii) Name the disease caused due to deficiency of this hormone.
Answer:
(i) Pancreas secretes insulin hormone.
(ii) Insulin regulates the conversion of glucose to glycogen, i.e., it lowers blood glucose level.
(iii) Deficiency of insulin hormone causes diabetes .

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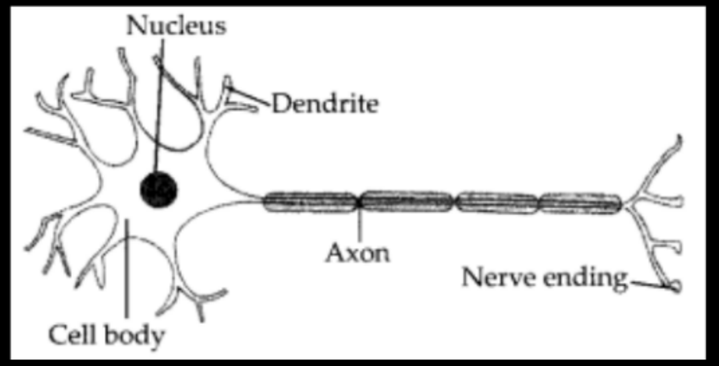
2023/ 2020:

Question (3 Marks): Draw a neat and labeled diagram of a neuron. Explain its function briefly.

Answer:



- **Function:**
  a. **Dendrites: Receive impulses from receptors or other neurons.**
  b. **Axon: Transmits impulses away from the cell body.**
  c. **Synapse: Transfers impulses to the next neuron or effector.**

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2023 (3 Marks):

Q: Name the glands responsible for the secretion of the following hormones:

(a) Adrenaline

(b) Insulin

(c) Parathyroid hormone

Write one function of each hormone.

Answer:

(a) Adrenaline: Secreted by adrenal glands; prepares the body for fight-or-flight responses by increasing heart rate and blood pressure.

(b) Insulin: Secreted by pancreas; regulates blood sugar levels by converting glucose into glycogen in the liver.

(c) Parathyroid hormone: Secreted by parathyroid gland; regulates calcium and phosphorus levels in the body for strong bones and teeth.

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2021 (2 Marks):

Q: What is the role of the thymus gland in the body?

Answer:

The thymus gland produces T-lymphocytes, which play an essential role in the body's immune system by protecting it against infections. It is most active during childhood.

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2022 (3 Marks):

Q: Name the hormones secreted by the testes and ovaries. State their functions.

Answer:

- **Testes: Secrete testosterone, which controls the development of secondary sexual characteristics in males, such as facial hair, deep voice, and muscle growth.**
- **Ovaries: Secrete estrogen (controls secondary sexual characteristics in females like development of breasts) and progesterone (prepares the uterus for pregnancy and maintains it).**

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2021 (3 Marks):

Q: Name any three endocrine glands and their hormones. State their functions.

Answer:

1. **Thyroid Gland:**
   - **Hormone: Thyroxin.**
   - **Function: Regulates metabolism and growth.**
2. **Pancreas:**
   - **Hormone: Insulin.**
   - **Function: Regulates blood sugar levels.**
3. **Adrenal Gland:**
   - **Hormone: Adrenaline.**
   - **Function: Prepares the body for fight-or-flight responses.**

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2023:

Question (3 Marks):

(a) Name the gland that secretes:

(i) Insulin

(ii) Thyroxin

(b) Why is thyroxin important for the body?

Answer:

(a) (i) Insulin - Pancreas

(ii) Thyroxin - Thyroid gland

(b) Thyroxin regulates metabolism, growth, and development. Its deficiency causes goitre.

Abhay Premier League

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2019 (3 Marks):

Q: How does the pancreas function as both an endocrine and exocrine gland?

Answer:

Endocrine Function: The pancreas secretes hormones like insulin and glucagon, which regulate blood sugar levels.

Exocrine Function: The pancreas produces digestive enzymes (amylase, lipase) that are released into the small intestine to aid digestion.