CONTROL AND COORDINATION

Control and Coordination

All the living organisms respond and react to changes in the environment around them.

Examples - Withdrawal of hand on touching hot object.

Stimuli

The changes in the environment to which the organisms respond is called stimuli such as light, heat, cold, sound, smell, touch etc.

Plants and animals both respond to stimuli but in different manner.

Control And Coordination in ANIMALS

It is brought about in all animals with the help of two main systems.

a) Nervous System
b) Endocrine System

Nervous System

The nervous system is made of Brain, Spinal Cord and a huge network of Nerves.

Functions of Nervous System –

i) To receive information from environment.

ii) Controls all voluntary muscular activities. Example- running and writing.

iii) Enables us to remember, think and reason.

iv) Regulates involuntary activities such as breathing and beating of the heart

Receptors

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

a) Ear :

- Used in Hearing
- Help in making Balance of Body

b) Eyes :

- Photoreceptors
- Used in Seeing

c) Skin :

- Thermoreceptors
- Used in feeling temperature like Hot or Cold
- Touch

d) Nose :

- Olfactory receptors
- Used in Smelling

e) Tongue :

- Gustatory receptors
- Used in Tasting (Sweet or Salty)

Neuron

Structural and Functional unit of nervous system.

Parts of Neuron:

1) Dendrites -

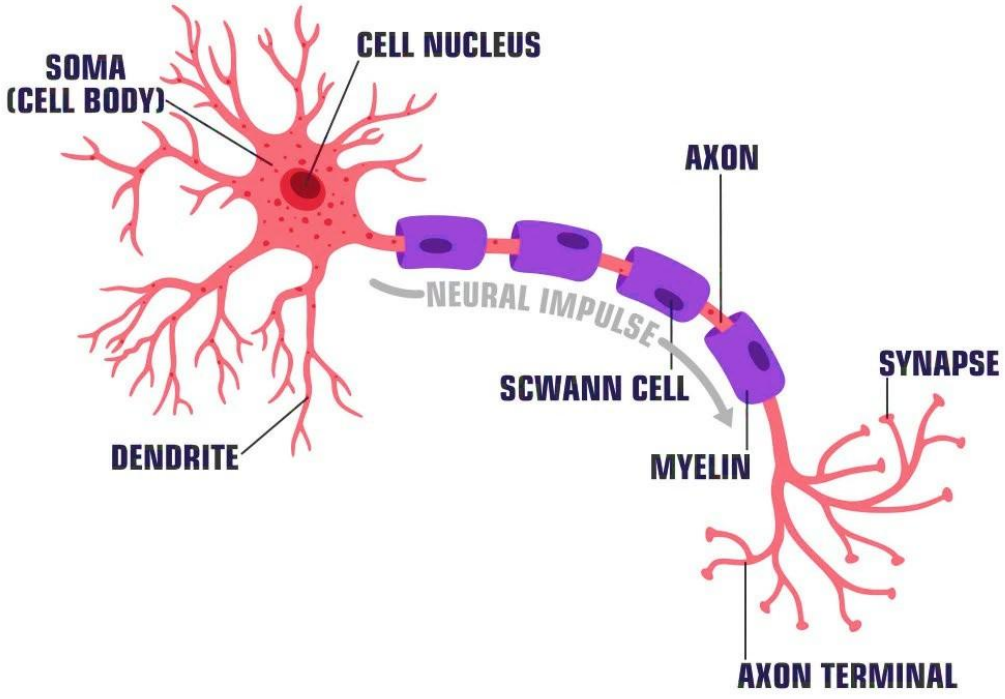
It receives information.

2) Cell Body -

The received information by dendrites is now traveled as an electrical impulse by Cell Body.

3) Axon -

It is the longest fibre on the cell of body is called Axon. It transmits electrical impulse from cell body to dendrite of next neuron.



Synapse

It is the gap between the nerve ending of one neuron and dendrite of other neuron.

In this electrical signal is converted into chemical signal.

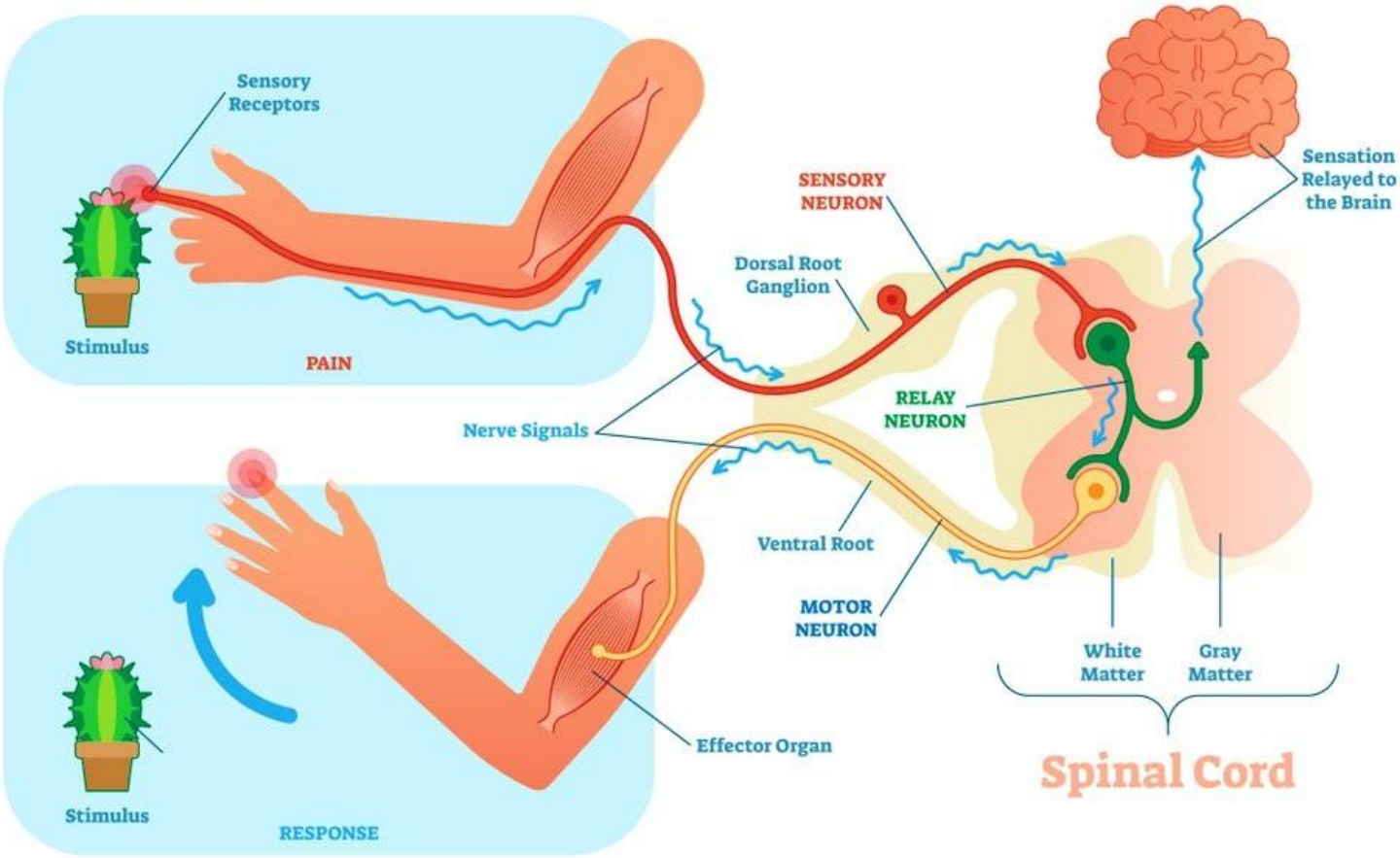
Reflex Action

Reflex action is quick, sudden and immediate response of the body to a stimulus.

Examples - When you smell your favorite dish, your mouth waters.

Reflex Arc -

The pathway through which nerve impulses pass during reflex action is called Reflex Arc.



Response:

Responses are of three main types –

1. Voluntary
    - Controlled by Fore Brain.
    - Eg. Talking, Writing.

2. Involuntary
    - Controlled by mid and back brain.
    - Eg. Heartbeat, Vomiting, Breathing

3. Reflex Action
    - Controlled by Spinal cord.
    - Eg. When you touch a hot object, you withdraw your hand from it immediately.

Need of Reflex Actions

In some situations such as touching a hot object, pinching etc. We need to act quickly, otherwise our body would be harmed.

Here response is generated from spinal cord instead of brain.

Human Nervous System

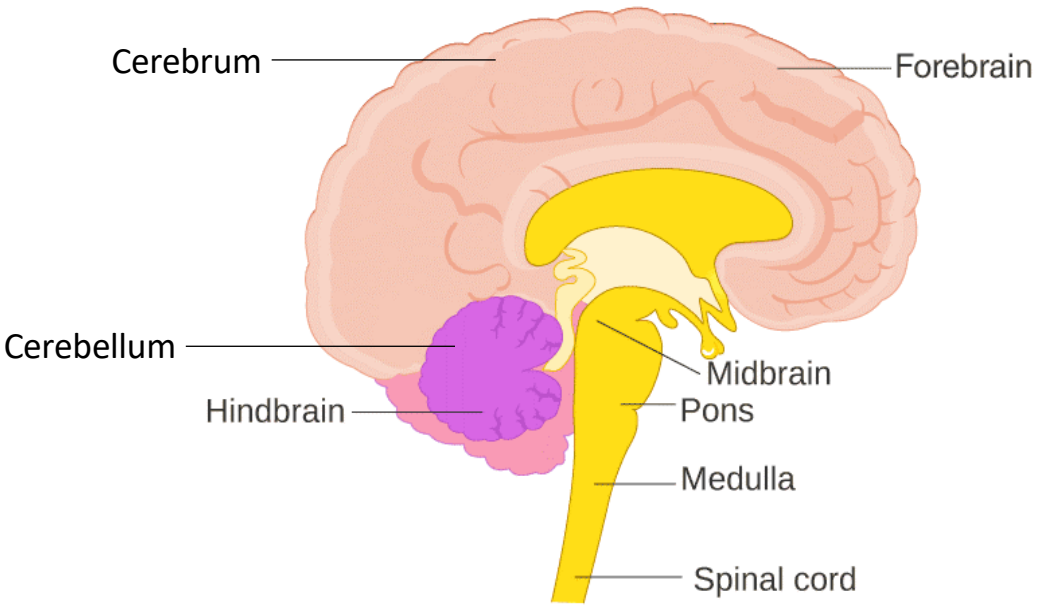
- Central Nervous System
  - Brain
  - Spinal Cord
- Peripheral Nervous System
  - Cranial Nerves arise from Brain
  - Spinal Nerves arise from Spinal Cord

HUMAN BRAIN

Brain is the main coordinating centre of the body.

It has three major parts -

1) Fore (Front) – Brain
2) Mid (Middle) – Brain
3) Hind (Back) – Brain



1) Fore (Front) Brain

It is the most complex part of the brain. It consists of Cerebrum.

Functions –

i) Thinking part of the brain
ii) Control the voluntary actions
iii) Store Information (Memory)

2) Mid (Middle) Brain

It connects the Fore (Front) – Brain with Hind (Back) – Brain

Functions –

i) Controls Involuntary actions
ii) This part of brain helps in changing Size of Pupil in our Eyes
iii) Controls Reflex movements of Head, Neck

3) Hind (Back) Brain

It has three parts -

i) Cerebellum -

Controls posture and balance. Precision of voluntary actions Eg. Picking Pen.

ii) Medulla -

Controls involuntary actions e.g. blood pressure, Vomiting

iii) Pons -

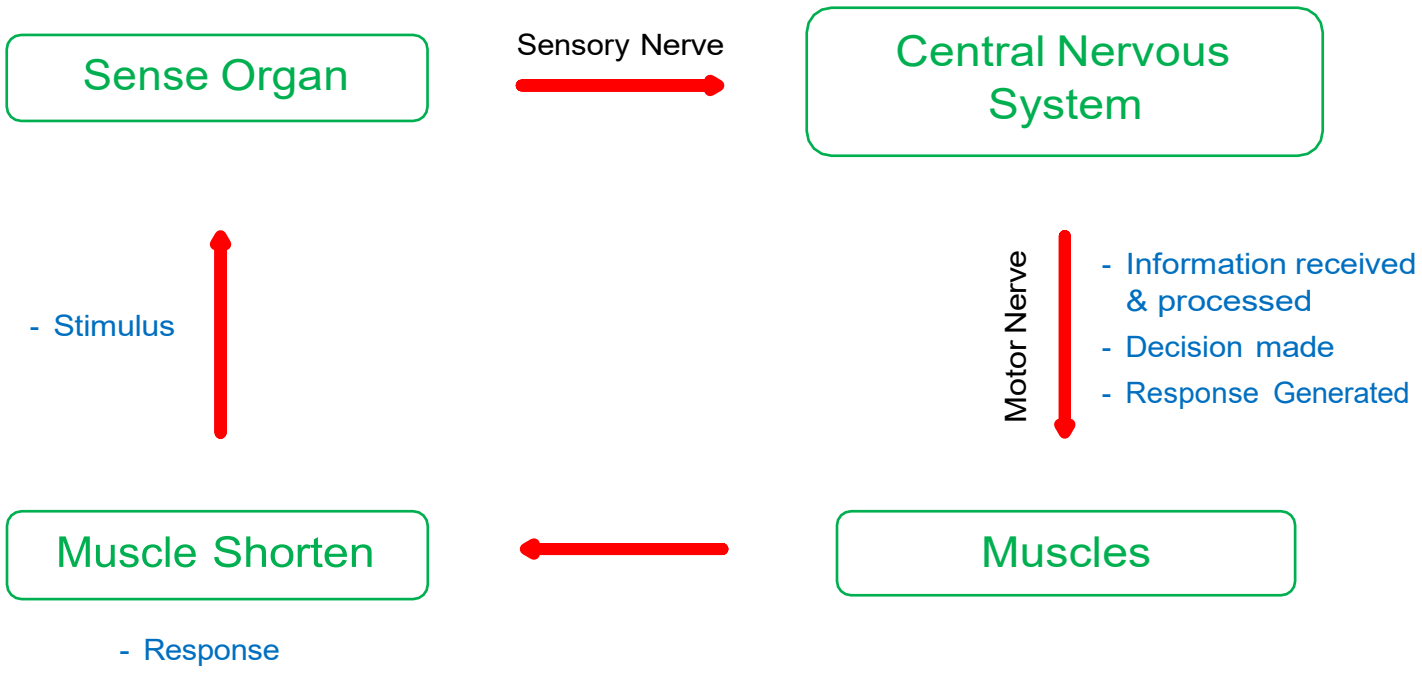
This also controls Involuntary actions but of different types like Breathing

Protection of Brain and Spinal Cord

a) Brain - Brain is protected by a fluid filled balloon which acts as shock absorber and is enclosed in cranium (skull or brain box)

b) Spinal Cord - Spinal cord is enclosed in vertebral column.

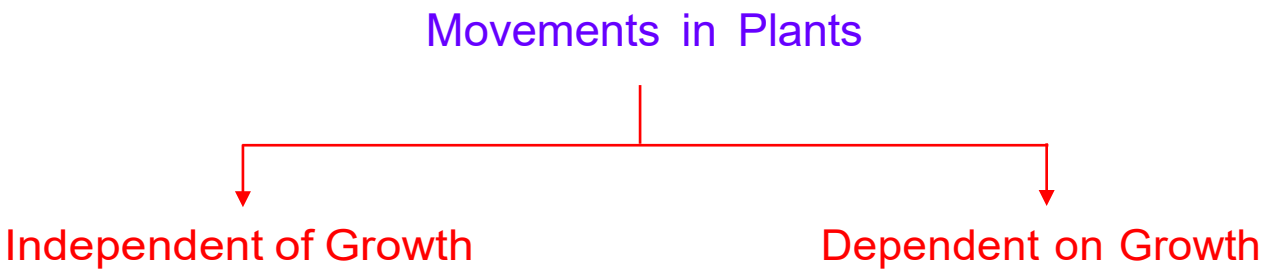
Coordination between Nervous and Tissue



Limitations of Electric communication/ Nervous System:

- Electric impulse will reach only to those cells that are connected by nervous tissue.
- After generation and transmission of an electrical impulse, the cell takes some time to reset its mechanism before transmitting another impulse. So cells cannot continually create and transmit impulse.
- Plants do not have any nervous system.

COORDINATION IN PLANTS



1) Independent of growth

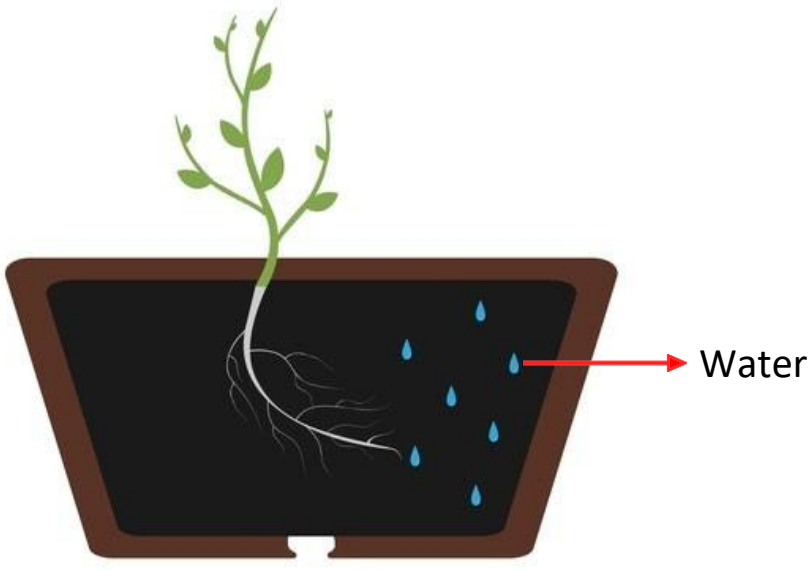
- Immediate response to stimulus
- Plants use electrical-chemical means to convey information from cell to cell.
- For movement to happen, cells change their shape by changing the amount of water in them, resulting in swelling or shrinking of cells.

- Example, Drooping (प□□ का मुरझाना) of leaves of "Touch me not/ छुई मुई का पौधा) pant on touching it.

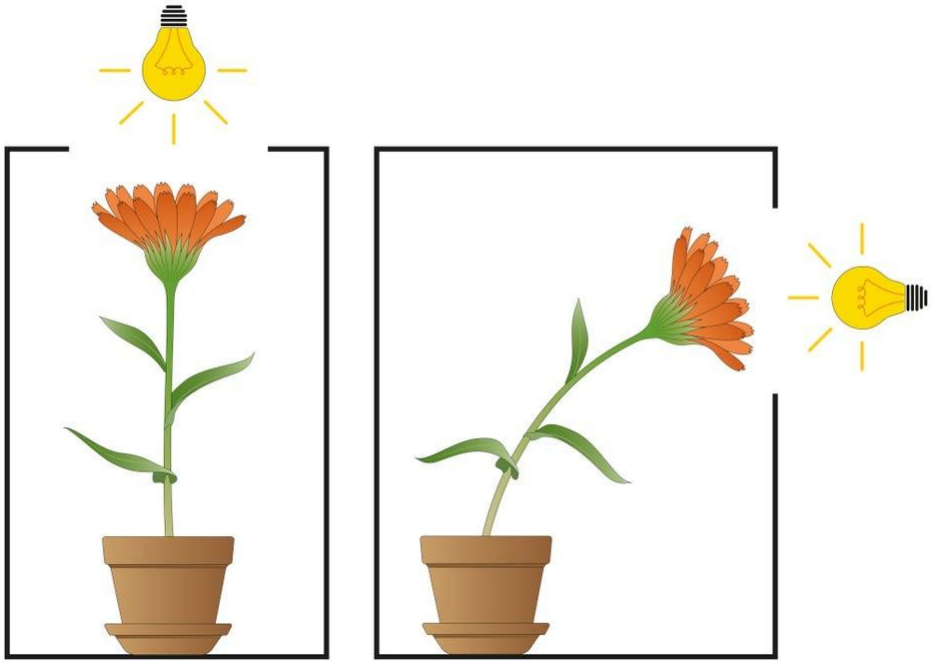
2) Dependent on growth

- These movements are tropic movements that is directional movements in response to stimulus.

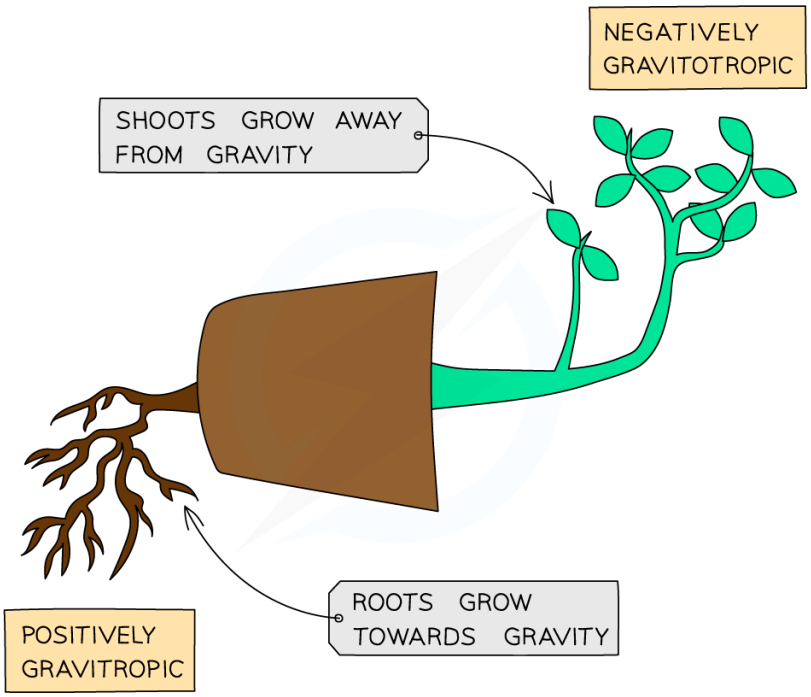
i) <u>Hydrotropism</u> - Movement towards water.



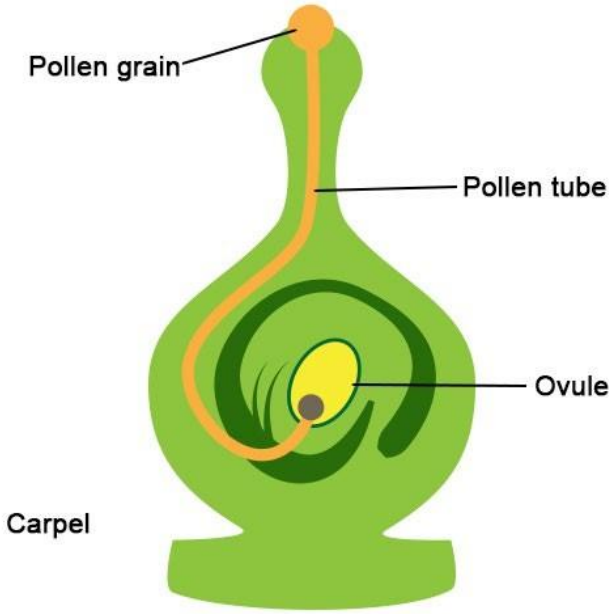
ii) Phototropism - Movement towards light.



iii) Geotropism - Movement towards/away from gravity.



iv) Chemotropism - Growth of pollen tube towards ovule.



v) Thigmotropism - The part of tendril away from the object grows more rapidly as compared to the part near the object. This causes circulating of tendril around the object.

Plant Hormones

Are chemical compounds which help to coordinate growth, development and responses to the environment.

Main Plant hormones are –

a) Auxin:

- Synthesized at shoot tip
- Helps the cells to grow longer
- Involved in phototropism

b) Gibberellin:

- Helps in growth of the stem

c) Cytokinin:

- Promotes cell division
- Present in greater concentration in fruits and seeds

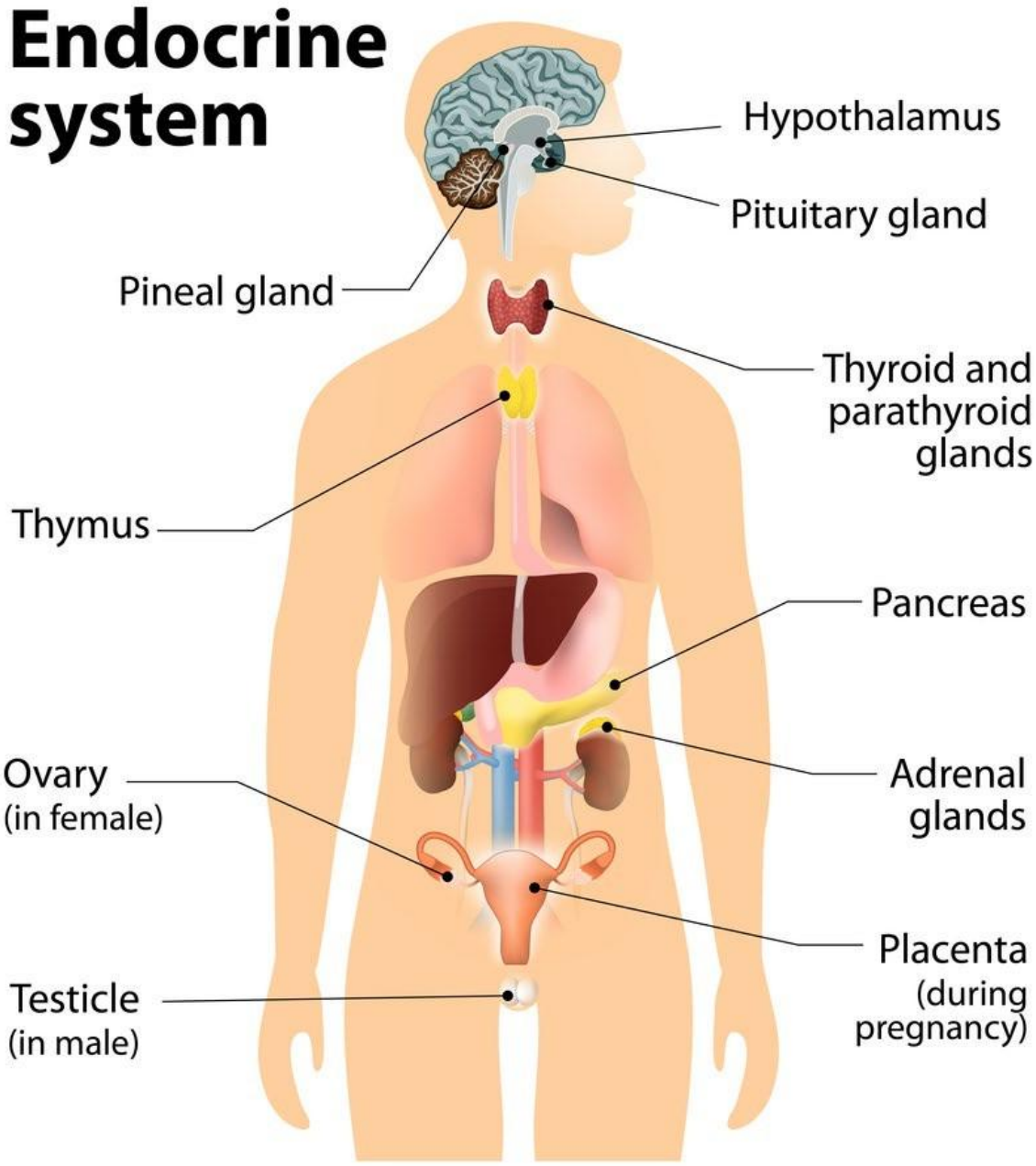
d) Abscisic Acid:

- Stops Growth
- Cause wilting of leaves
- Stress hormone

Hormones in Animals

Hormones - Hormones are the chemical substances which coordinate the activities of living organisms and also their growth.

Endocrine glands - These glands secrete their product (Hormone) into the blood.



Endocrine Gland	Location	Hormones Produced	Functions
Pituitary Gland	Under the Brain	Growth hormone	Helps in increasing Height
Thyroid Gland	Neck	Thyroxine	Controls general metabolism and growth in the body.
Adrenal Gland	Above kidneys	Adrenalin	Prepares the body for emergency situations
Pancreas	Near stomach	Insulin	Controls blood sugar level
Testis (Boys)	In Scrotum	Testosterone	Sperm production, development of secondary sexual characters during puberty in Boys
Ovary (Girls)	Near Uterus	Estrogen	Egg production, development of secondary sexual characters during puberty in Girls

Iodised salt is necessary because iodine mineral is essential part of thyroxine hormone secreted by thyroid gland. Thyroxine regulates metabolism of carbohydrates, fats and proteins. So, we must consume iodised salt which is necessary for proper working of thyroid gland. Its deficiency causes a disease called Goiter (Swollen Neck).

DIABETES

Disease in which blood sugar level increase.

Cause - Due to the deficiency of insulin hormone secreted by pancreas that is responsible to control blood sugar levels.

Treatment - Injections of insulin hormone.

Feedback Mechanism

The excess or deficiency of hormones has harmful effects on our body. Feedback mechanism makes sure that hormones should be secreted in precise quantity and at right time.

Example - Feedback mechanism to control the sugar level in blood is as follows: