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CONTROL & COORDINATION

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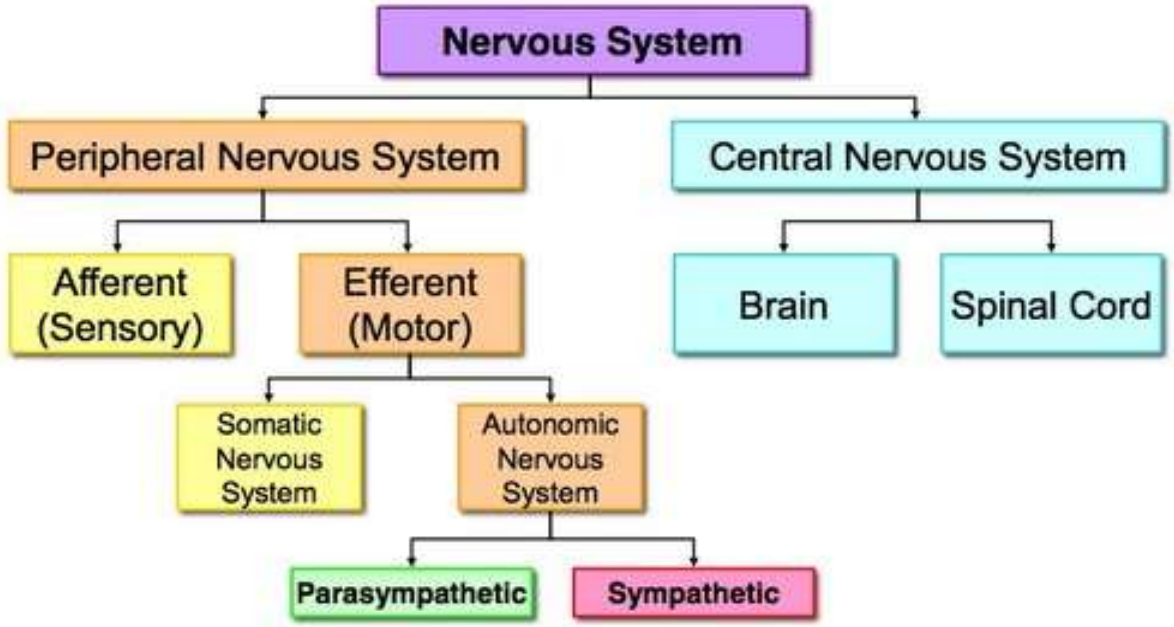
FOR REVISION



TERMS USED IN CONTROL & COORDINATION:

1. Response: The movement which takes place in an organism's body in relation to the change received from environment.
2. Stimulus: Any change received by an organism from environment is 'stimulus'. 'Example: Heat, Cold, Touch, Taste, Smell are Stimulus.
3. Impulse: The electrical signals which takes a message from one part of body to another through a nerve is 'impulse'.
4. Synapse: The gap between two consecutive neuron through which an impulse jumps/floats from one neuron to another is 'synapse'.
5. Receptors: All the sense organs i.e. nose, ears, eyes, skin & tongue receives the stimulus & converts these stimulus into impulse. These organs are called 'receptors'.
6. Effectors: Muscles which receives impulse either from brain or spinal cord in order to respond to a stimulus are called effector organs.

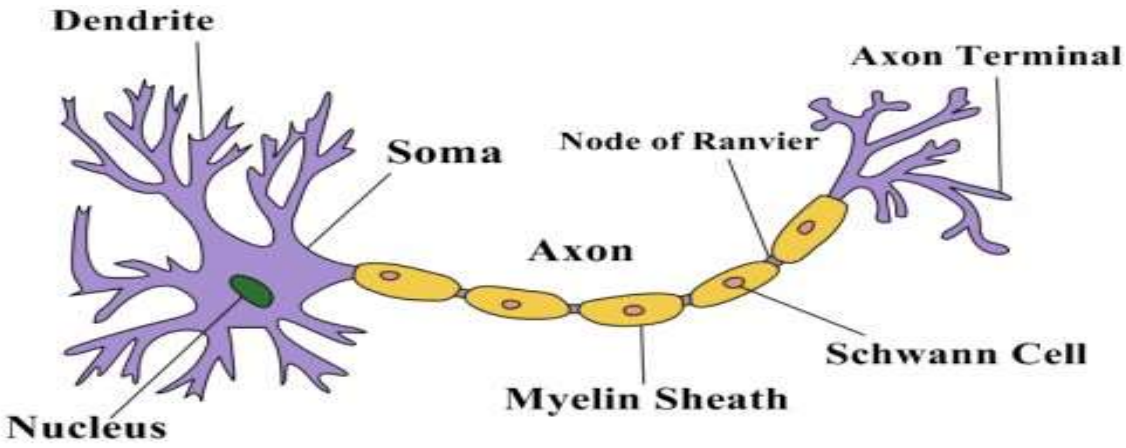
TYPES OF CONTROL & COORDINATION:

1. Control & Coordination in plants – consist of chemical control system only.
2. In animals it includes two types:- (a) Nervous system (b) Chemical control system (endocrine system).

NERVOUS SYSTEM: Nervous system in animal can be divided into three heading:-
(a) Peripheral (b) Central nervous system (c) Autonomous.

Peripheral: The nervous system which consists of nerves and the neurons (nerve cell) is called 'peripheral'. Neurons are of three types: - (a) Sensory neuron (b) Motor neuron (c) Multi polar /relay neuron.

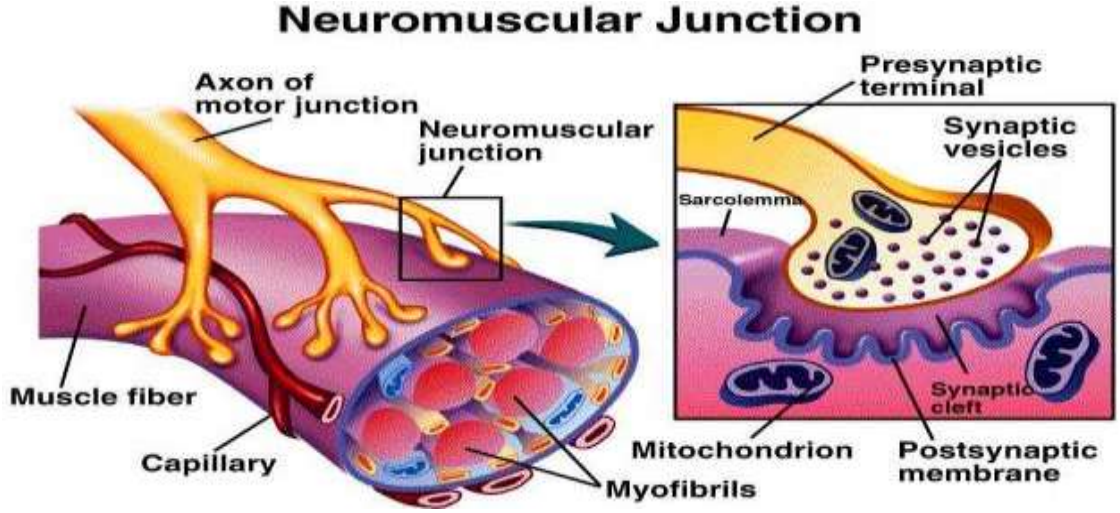
Sensory neuron: Those neurons which carry impulse from sense organs to the organs of central nervous system are known as 'sensory neuron'.



Motor neuron: Those neurons which transfer impulse for an stimulus from central nervous system to the effectors organs are known as 'motor neuron'.

Multi polar neuron: Those neurons which are connected to sensory as well as motor nerves and help in communicating by themselves.

Neuromuscular junction:- the place where the nerve endings of a neuron transfers impulse to the muscles is known as 'neuro muscular junction'. At this junction the mitochondria of the nerve ending transfers energy to mite of muscle fibre that respond accordingly.



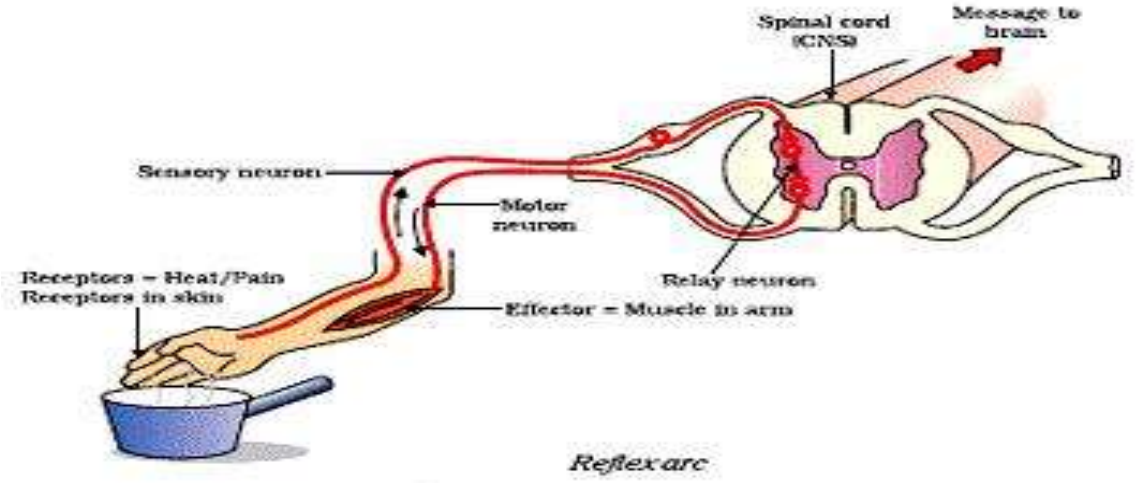
CENTRAL NERVOUS SYSTEM CONSISTS OF:

(a) Spinal cord
(b) Brain

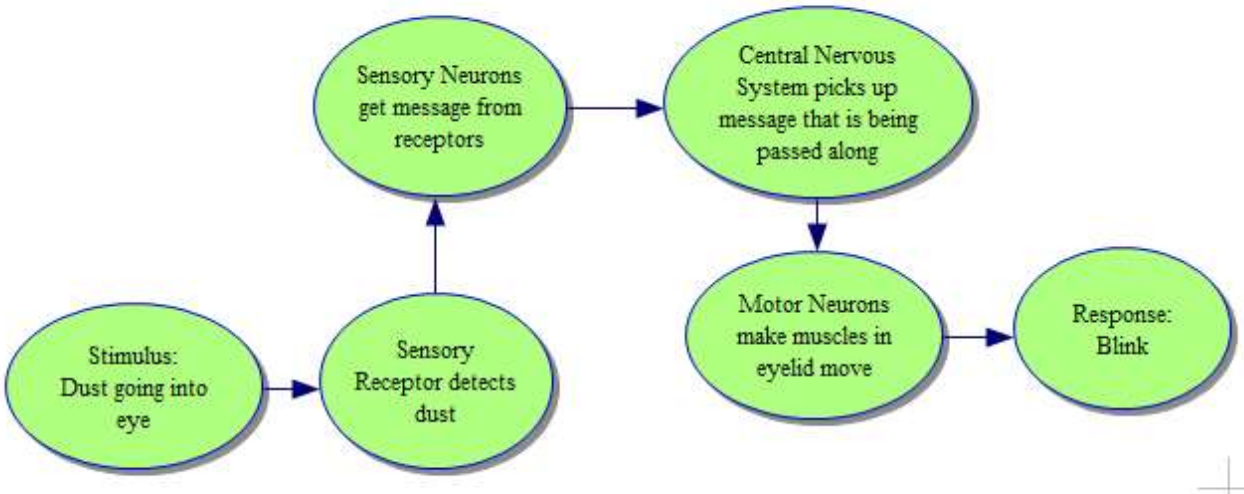
SPINAL CORD: The extension of brain which runs through the neck and enters into backbone is called ‘spinal cord’. From spinal cord, 31 pair of spinal nerve arises which controls all the reflex actions.

Reflex action: Those actions which are very quick and are emergency responses, Controlled by spinal cord are known as ‘reflex action’. For example:- On touching a hot plate we withdraw our hand, Producing saliva when smelling good food & Sneezing when dust particles enter our nostrils.

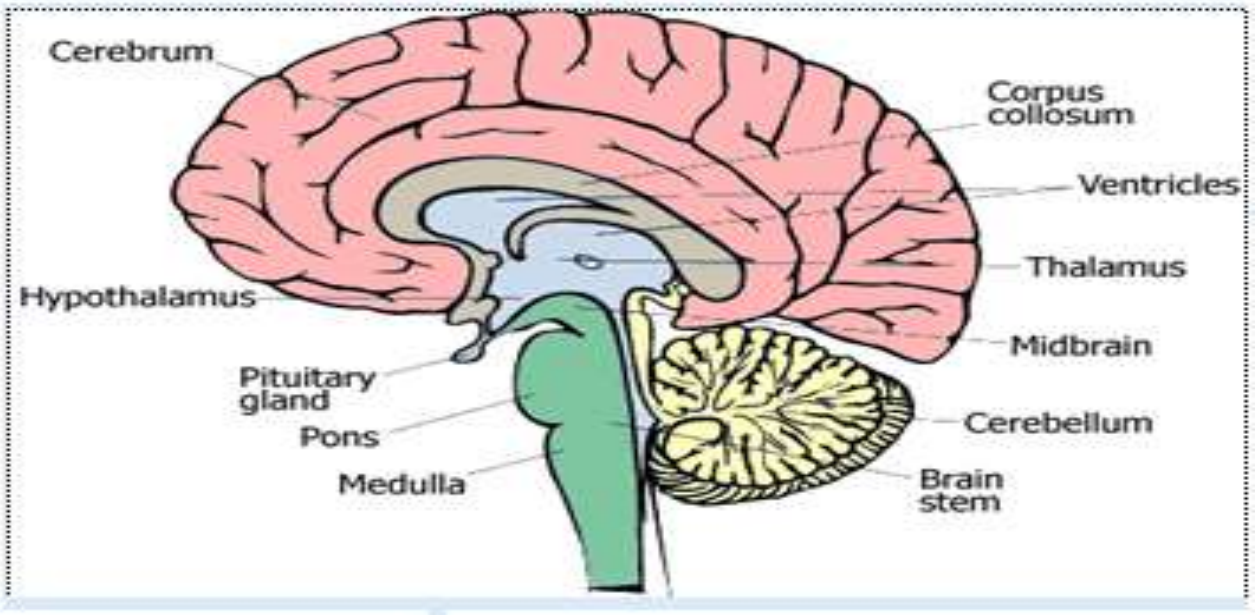
Reflex arc: The systematic movement of impulse from sense organs to spinal cord and then to effector organs for a quick and favourable response is called ‘reflex arc’.



Reflex arc

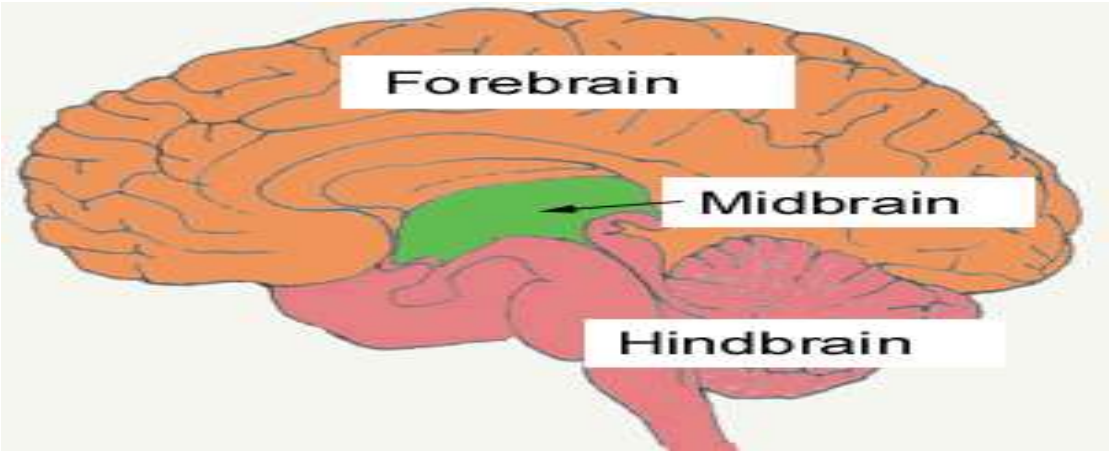


BRAIN:



Human brain is enclosed in a bony cavity called ‘skull’ which is made up of eight bones in which all bones are fixed and do not move except for the bones of lower jaw cavity made by skull where brain lies is known as carmine. Brain is surrounded and covered by a double membrane layer called ‘meninges’. These layers protect the brain from any kind of mechanical injury.

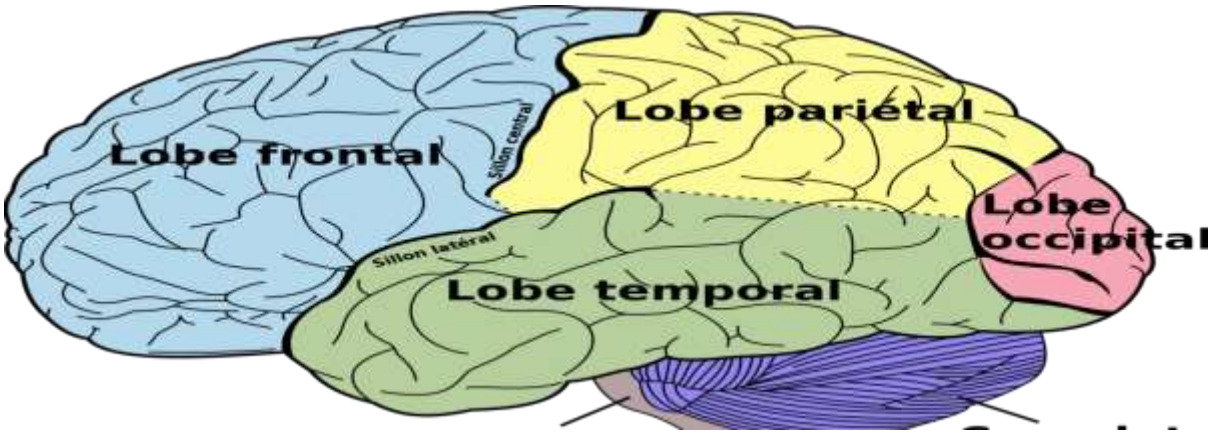
Brain is made up of three parts:- (a) fore brain (b) mid brain (c) hind brain.



FORE BRAIN: it is the largest part of the brain which is further made up of two important parts:- (a) cerebrum (b) lobes.

Cerebrum: It is the largest part of the fore brain and is highly complicated. It forms the cap of brain and is divided into two cerebral hemisphere:- (a) left cerebral hemisphere (b) right cerebral hemisphere. Fore brain is the main thinking part of the brain. It is also the site of intelligence and also has regions of memory and analysis. Abstract thinking.

Lobes:



Fore brain is divided into four lobes:- (a) frontal lobe (b) temporal lobe (c) occipital lobe (d) parietal lobe

Frontal lobe: This is a region found in fore head and controls all types of muscular movement.

Temporal lobe: This area of cerebrum which is found below the ears and helps in proper hearing.

Occipital lobe: This area is found in the back of region and controls normal functioning.

Parietal lobe: This area is found just at the central part of cerebrum. It controls most of incerulatary actions like sneezing, hiccups, coughing, etc.

MID BRAIN: The midbrain is mainly involved in the motor functions of the body such as vision, basic movements and hearing.

HIND BRIAN: It is divided into three types :- (a) pons (b) medulla (c) cerebellum.

Pons: It helps in controlling respiratory system and its whole mechanism.

Medulla: It is the last part of the brain where spinal cord starts. Medulla oblongata regulates swallowing, coughing, sneezing, vomiting. It also regulates blood pressure and salivation.

Cerebellum: It controls coordination between voluntary actions. It also helps in maintaining posture and balance.

ROLE OF BRAIN IN REFLEX ACTION:

Brain also involved in reflex action which is also called ‘secondary reflex’. For example:- when we touch a hot plate we withdraw our hand is controlled by spinal cord whereas pouring the water and blowing air over the burnt part is controlled by brain.

COORDINATION IN PLANTS:

Unlike animals plants do not have nervous system. They have different types of coordinate systems.

Coordination systems in plants can be studied under three headings:- (a) Movement neither towards stimulus nor away from the stimulus. (b) Movement due to growth or towards stimulus. (c) Movement due to hormones.

Movement neither towards stimulus nor away from the stimulus:

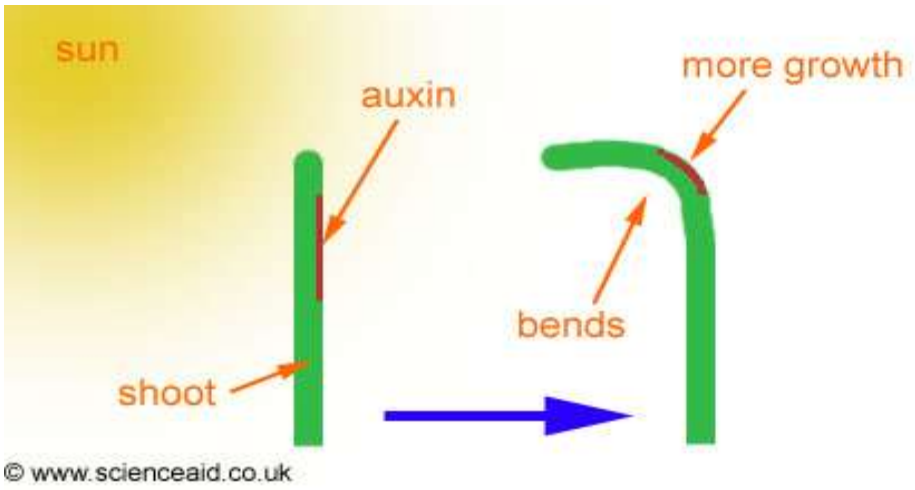
In few plants like Mimosa pudica (touch-me-not) when leaves are touched with an object the leaves collapse by their own, this is due to the fact that when we touch the leaves petiole of the leaf withdraw water which makes the leaves collapse but when influence of touch is over then water again returns to the cells of the leave making them open such movements known as ‘nastic movements’.

Movement due to growth:

There are different parts of the plant which show their movement due to growth. For example:- the tendrils of the plant are sensitive towards touch. When they touch any support the part of touch with tendrils with the support shifts its hormone to opposite side which makes the tendrils to grow on opposite side. Result, growth is done in opposite side and they roll on the support, such type of movement which takes places towards the stimulus are known as ‘tropism’.

There are different types of tropism shown in the plants:- (a) phototropism (b) geotropism (c) chemotropism (d) hydrotropism.

Phototropism:

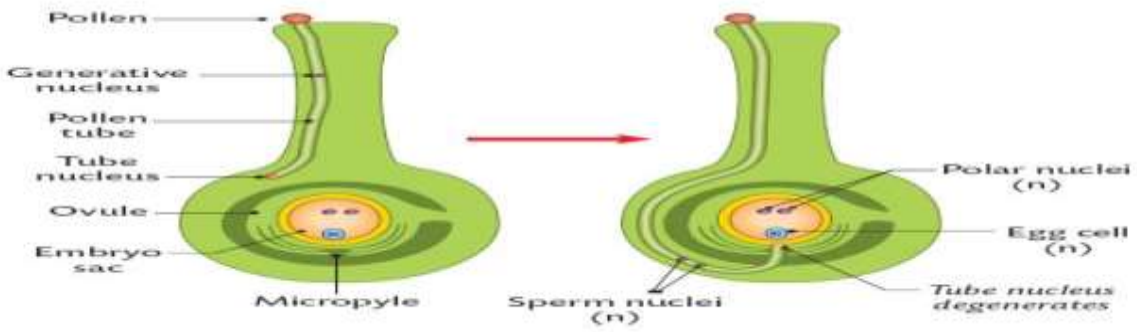


The movement of plant parts specially the Arial parts (shoot) towards the light is known as '+ve phototropism'. For example:- when we keep a potted plant in a dark room near a window where light is coming into the room for few days we will observe that the stem will turn towards sunlight coming to the window showing phototropism.

Geotropism

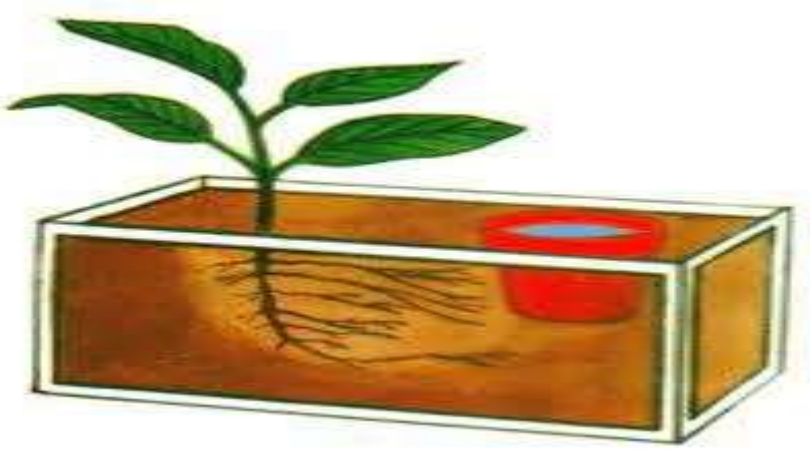
The movement of plant parts towards gravity is known as geotropism. It can be of two types:- '+ ve geotropism' & ' -ve geotropism'. For example:- when a potted plant is kept horizontally for few days and its base is removed the root bends towards the ground showing '+ ve geotropism' and stem bend away the ground showing ' -ve geotropism'.

Chemotropism



The movement of plant part towards the chemical is known as chemotropism. For example: the growth of pollen tube towards the ovule is due to attraction by chemicals and hence known as chemotropism.

Hydrotropism



The movement of plant part towards the water is known as hydrotropism.Movement due to hormones in various plants:

Hormones are the chemical regulators which control all type of growth related movements. Plant hormones are categories into four important group:-

(a) Auxin: It promotes cell enlargement and cell differentiation. They also promote growth.
(b) Gibberelin: It promotes cell enlargement and differentiation in the presence of auxin. It also helps in breaking dormancy in seed and bud. It promotes growth in fruit.
(c) Cytokinin: It promotes cell divisions and help in breaking the dormancy of seed and buds. It delays the aging in leaves. It promotes opening of stomata and also fruit growth.
(d) Abscisic acid: It maintains dormancy in seeds and buds. It promotes the closing of stomata and falling of leaves. It inhibits growth. Reversing the effects of auxin and gibberelin. It effects include wilting of seeds.
(e) Ethene promotes falling of leaves, ripening of fruits and helps in breaking bud dormancy and only includes flowering.

ANIMAL HORMONE: Animal hormones are produced by special glands known as endocrine glands. Major endocrine glands in human are:- (a) pituitary gland (b) thyroid gland (c) parathyroid gland (d) adrenal gland (e) testes (f) ovary

Pituitary gland: This gland is found in the brain and also known as master gland. It is called this because it produces important hormones which control the functioning of the other gland. It also produces growth hormones. The deficiency of which causes dwarfness and excess of which causes gigantism.

Thyroid gland: This gland is found in the neck region and produces an important hormone thyroxin which regulates carbohydrates, proteins & fat metabolism so as to provide best

balance for growth. Iodine is important for thyroxin. Deficiency- goitre (adult deficiency) cause a disease cretinism in children(feeble mindedness).

Adrenal gland: This gland produces adrenaline which secreted directly into the blood and control heartbeat maintain blood pressure and helps in increasing oxygen during an emergency situation hence this hormone regulates the conditions during flight and fright.

Testes gland: This is also a dual function gland. They start producing hormone at the age of 12-14 years. Hormone- tectostcrene which develop secondary sexual characters in males.

Ovary gland: This produces hormone estrogens and progesterone which develops secondary sexual characters in females.

Feedback mechanisms have evolved in living things as a mechanism by which they maintain **homeostasis** or **dynamic equilibrium**.

A **feedback mechanism** occurs when the level of one substance influences the level of another substance or activity of another organ.

An example of a feedback mechanism in humans would be the increase in heart rate and respiratory rate which occurs in response to increased exercise or other increased muscle cell activity. Some other examples of feedback mechanisms in living things appear below.

The pancreas is an endocrine gland which produces hormones which regulate blood glucose (sugar) levels

An **increase** in blood sugar level triggers the release of the hormone **insulin** by the pancreas the hormone insulin lowers blood sugar level restoring the body to its original blood glucose level in two major ways:

- it increases the ability of body cells to take in glucose from the blood
- it converts blood glucose to the compound **glycogen** -- this compound is also called animal starch and is stored in our liver and muscles