10th control and coordination solved Questions

1. What is the difference between a reflex action and walking?

Reflex action is-

a. Generally a quick action in response to a stimulus where sudden action without thinking is needed. For example, if a person accidentally touches a hot iron, he retracts his hand suddenly without having knowledge of what he is doing. This happens in a fraction of a second.

b. Reflex action is controlled through the ***reflex arc*** in which signal is transferred from the sensory nerve to the motor nerve directly through a transfer neuron. Thus in reflex action the signal travels very quickly and incites the action.

c. The complex process of thinking ***does not*** take place in reflex action.

d. Reflex action is *mediated and controlled by the spinal cord* where transfer of signals takes place from sensory neuron to the motor neuron takes place.

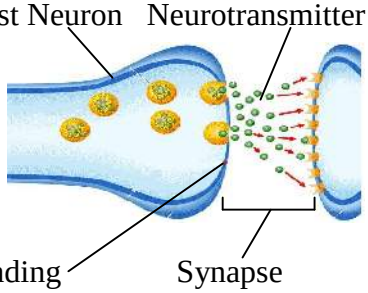
Walking on the other hand is-

a. ***Not*** a quick action in response to a stimulus. It is a well controlled action by the brain.

b. Different centers of the brain control the body€s posture and balance of the body during walking.

c. *During walking the brain is conscious all the time about the action* and it also controls the direction in which the person is walking.

2. What happens at the synapse between two neurons?



Synapse is the microscopic gap between two neurons where electric signal (impulse) is transferred from nerve ending of first neuron to the receiving dendrites of the second neuron.

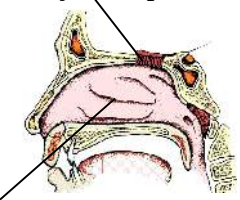
When the impulse reaches the nerve ending of the first neuron it releases chemicals called neurotransmitters into the synapse. These neurotransmitters are received by the dendrites of the next neuron to start the electric impulse again.

Thus in the synapse the impulse travels in the form of neurotransmitters, which pass on the signal to the next neuron. In the next neuron electric impulse is again generated and carried forward.

3. Which part of the brain maintains posture and equilibrium of the body?

The ***Cerebellum***, which is a part of hind brain controls and maintains posture and balance of the body during walking, sitting or doing other activities.

4. How do we detect the smell of an agarbatti (incense stick)?



When the gas produced by the agarbatti is inhaled it passes through the nose. When the gas passes over the ***Olfactory receptors*** (smell receptors) present in the Nasal cavity an *electric signal is generated in the olfactory receptors*. This signal is sent to the ***Cerebrum*** (fore-brain) where it is detected as smell.

5. What is the role of brain in reflex action?

The brain plays an important part in controlling ***Conditioned Reflex Actions.*** For example, a person learns from his child hood that by applying brakes to a moving vehicle (Eg. Bicycle) it can be stopped. This information is stored in his brain as a permanent memory.

Now at any time when he is moving a vehicle and suddenly somebody comes in the way he instantly (quickly or reflexively) applies the brakes without thinking. It is here that the brain plays its role of supplying the information for application of the brakes.

6. What are plant hormones?

Plant hormones *(also called Plant Growth Regulators) are the chemical substances in plants that control the growth and other activities in plants.* These are-

a. Auxins control the tropic (growth related) movements of the plants in response to light, gravity, touch etc by *increasing the size of cells*. Under the influence of Auxins the plant stem bends towards unidirectional light where as the roots bend away from it.

b. Gibberellins stimulate stem elongation and leaf expansion. Its application causes stem elongation in small •rosette€ plants such as cabbage. Spraying sugarcane plant with gibberellins increases the stem size thus increasing the yield.

c. Cytokinins are produced in regions of the plant body where rapid cell division occurs, such as root tips, developing shoot buds and young fruits and seeds. *Cytokinins promote growth by stimulating cell division*. They also help in production of new leaves and chloroplasts in leaves.

d. Ethylene causes ripening of the fruits.

e. Abscisic acid inhibits (i.e., slows down) the growth in different parts of the plant body. It also inhibits germination of seeds. It increases the tolerance of plant to different kinds of stresses such as temperature changes. So, it is also called the stress hormone in plants. It also causes the drying and falling of older leaves, flowers and fruits.

7. How is the movement of leaves of the sensitive plant different from the movement of shoot towards light?

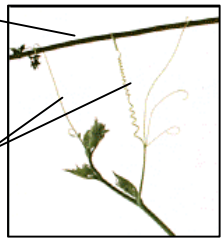
S.No	Movement of leaf of the sensitive plant	Movement of shoot (stem) towards light
1.	This movement is called Nastic movement.	This movement is called Tropic movement.
2.	It is not related to growth in a particular direction.	It is related to growth in a particular direction.
3.	It is a quick response to touch. It is not under the control of Auxin hormone.	It is a slow movement *under the control of Auxin hormone*.
4.	It occurs due to pressure changes in the leaf parenchyma cells due to loss of water by exosmosis.	It occurs due to Unidirectional growth of the stem stimulated by light coming from one direction.
5.	It is reversible i.e., the leaves again regain their original form after some time.	It is not reversible.

8. Give an example of plant hormone that promotes growth.

Auxin promotes growth of the plant stem by stimulating increase in the size of cells i.e., cell elongation. It is produced in the stem tip and conducted down wards. In the stem auxin causes cell elongation on the side which is away from light. This causes bending of the stem towards light.

The figure shows young plants of gram bending towards unidirectional light due to the effect of auxin.

Cytokinin is another plant hormone that promotes growth by stimulating cell division. It is present in root tips, developing shoot buds and young fruits and seeds.



9. How do Auxins promote the growth of a tendril around a support?

Tendrils are modified leaves and stems present in some climbing plants such as the pea plant. These tendrils twine i.e., wrap around some support and help the plant to climb up.

When the tendril touches a rough solid support, auxin hormone causes *more growth on the side of tendril away from the stem and less growth on the side touching the stem*. As a result, the tendril twins around the support forming a spring like structure, which supports the tender stem of the plant

10. Design an experiment to demonstrate hydrotropism.

Roots of the plants bend and grow towards the region of higher moisture in the soil. This bending of the roots towards water is called hydrotropism.

Procedure: Some germinating seeds of wheat or moong are placed in moist saw dust in a sieve. These are watered for a few days till the roots are seen coming out of the sieve.

Observation: It is observed that the small roots pass down through the sieve and come out of the sieve pores due to the effect of gravity (geotropism). After some growth, the small roots bend back and re-enter into the sieve in search of moisture (water). This shows hydrotropism in roots. It also shows that roots show stronger hydrotropism than geotropism.

11. How does chemical coordination take place in animals?

In Animals chemical coordination is by chemicals called ***Hormones*** produced by endocrine glands. The endocrine glands of the body form a system called the Endocrine system.

The endocrine glands produce hormones and release them into the blood. The blood carries these hormones to the site of action. For example, the Pituitary gland releases a hormone called Thyroid Stimulating Hormone (TSH) into the blood. The blood carries this hormone to the thyroid gland. The hormone stimulates the thyroid gland to produce and release its own hormone i.e., thyroxin.

The table given below lists the different endocrine glands, their hormones and the functions controlled by the hormones.

Gland	Position	Hormone	Function Of The Hormone
Pituitary gland	Below the brain.	Growth hormone	Promotes body growth by synthesis and deposition of proteins in the tissues, promotes growth of bones and muscles.
Thyroid gland	In the neck.	Thyroxin	Controls protein, carbohydrate and fat metabolism, increases the metabolic rate, increases physical and mental growth of the body, maintains the basal metabolic rate in the body.
Pancreas	Below the stomach.	Insulin	Reduces amount of blood glucose, increases the use of glucose in the tissues and storage of glucose as glycogen in the liver and muscles.
Adrenal glands	On the top of each kidney.	Adrenalin	Stress hormone. Helps us face stress. Increases blood flow to the skeletal muscles, increases blood sugar and respiration rate, increases heart beat and body temperature, dilates the blood vessels so that more blood flows to the muscles. Increases energy output in the body.
Testes	In scrotum of the male	Testosterone	Stimulates sperm production, Helps in development of male sex organs- prostate, penis etc, Development of male sex characters- beards, low pitch voice.
Ovaries	In abdomen of females.	Estrogen	Helps in development of female sex organs- uterus, tubes and mammary glands. Developments of female sex characters- high pitch voice, body hairs.

12. Why is the use of iodized salt advisable?

Iodine is a mineral. It is found in the earth crust and in the drinking water. *It is needed for the normal functioning of thyroid gland and the production of thyroxin hormone*, which is very necessary for the normal physical and mental growth of the body. Thyroxin hormone also controls proper metabolism and use of proteins, carbohydrates and fats in the body.

Deficiency of Iodine in the body causes the following problems-

a. Thyroid gland is not able to work properly and produce sufficient amount of thyroxin. It causes enlargement of the gland, a condition called Goitre.

b. Due to deficiency of Thyroxin hormone normal physical and mental growth does not take place.

Hence, to supplement iodine in the diet (food), iodized salt is advisable. Iodized salt supplies iodine for the normal functioning of the thyroid gland.

13. How does our body respond when adrenalin is secreted in the body?

Adrenalin is also called stress hormone. It is secreted by the Adrenalin glands when the body is under stress.

Adrenalin helps the body to face stress by ***increasing the respiration rate to increase the output of energy in the body.***

a. It increases heart beat so that more blood flows in the arteries to supply oxygen and glucose to the tissues for faster respiration.

b. It increases blood flow to the skeletal muscles of arms and legs by dilating the arteries of these organs. Thus, blood from the internal organs is diverted to the muscles of arms and legs.

c. It increases the blood sugar (i.e., glucose) level.

d. It also increases the breathing rate so that the blood takes more oxygen for faster respiration.

e. It increases heat production in the body.

14. Why are some patients of diabetes treated by giving injections of insulin?

Insulin hormone produced and released by the pancreas helps in controlling the blood sugar level. It helps in changing the extra glucose present in the blood to glycogen and storing it in the liver and body muscles.

In patients suffering from Diabetes, insulin is not produced in sufficient quantity to control the blood sugar (glucose) level. Their blood sugar level may increase abnormally after having food rich in starch and sugar. So they are given injections of insulin after a meal so that blood glucose level becomes normal. The normal level of blood glucose is 80-100 mg per 100 ml of blood.

15. Which of the following is a plant hormone?

a. Insulin

b. Thyroxin

c. Oestrogen

d. Cytokinin ✓

16. The gap between two neurons is called a

a. Dendrite.

b. Synapse. ✓

c. Axon.

d. Impulse.

17. The brain is responsible for

a. Thinking.

b. Regulating the heart beat.

c. Balancing the body.

d. All of the above. ✓

18. What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise?

Receptors are specialized tips of nerve cells in sense organs to receive stimulus (information) from the environment. The receptors generate electric impulse that is sent by sensory nerves for information to the spinal cord and the brain. Examples of receptors are-

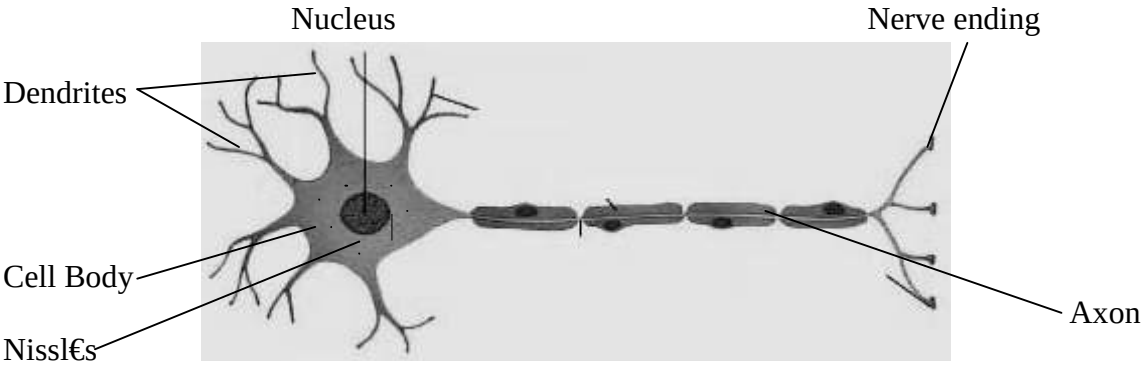
a. *Rod and cone cells are present as receptors in the retina of the eyes*. They generate electric impulse when light falls on them. This electric impulse is carried to the brain to give us the sensation of sight.

b. Olfactory receptors are present in the nasal cavity to detect smell of different materials.

c. Gustatory receptors are present in the tongue to detect taste of different food items that we eat.

If the receptors do not work properly, proper information will not be sent to the brain and the brain will not able to incite proper action. For example, an old man whose eye sight has become weak may not be able to see a car speeding on the road and meet with an accident.

19. Draw the structure of neuron and explain its functions.



Neuron- unit of nervous tissue

A Neuron (nerve cell) consists of the following parts-

a. ***A cell body*** (cyton) containing different cell organelles and the nucleus. The cytoplasm in the cyton also contains Nissl€s granules.

b. ***Dendrites*** are small processes of the neuron. These work to collect the signal and send it towards the cell body.

c. ***Axon*** is the long process of the neuron. It conducts the impulse away from the cell body.

d. ***Nerve ending*** is the ending of axon in knob like structures. These structures release chemicals called neurotransmitters into the synapse to transfer the impulse to the next neuron.

The Neuron or the nerve cell thus works to collect the electric impulse from a sensory receptor or the preceding neuron and transfer it forward to the next neuron.

20. How does Phototropism occur in plants?

Phototropism is the growth movement in response to unidirectional stimulus of light. It is seen in plant stems, roots, leaves and even in flower heads (Eg. Sun flower)

Plant stems show positive phototropism by bending in the direction of light. *This curvature in the stem towards light is due to the hormone called Auxin*, which is produced in the stem tip. Auxin causes more cell elongation on the side of the stem, which is opposite to light i.e., darker side. On the lighted side there is less cell elongation. This causes the stem to bend in the direction of light.

21. Which signals will get disrupted in case of spinal injury?

Spinal Cord is the elongated part of the nerve cord i.e., the Central Nervous System. It runs inside the back bone, which protects it from injury. Following are the main functions of Spinal Cord-

a. Spinal cord serves receives ***incoming signals*** brought to it by the peripheral nerves from many parts of the body including the skin. These signals are sent to the brain for further processing.

b. Spinal cord also relays ***outgoing signals*** from the brain to different muscles of the body for action.

c. Spinal cord also serves as an intermediate in the reflex arc, where signals are transferred from sensory neurons to motor neurons for quick action.

In case of spinal injury all the above mentioned functions will get disrupted and the normal flow of signals in the whole body will not take place. This may cause paralysis or non-functioning of muscles in different parts of the body.

22. How does chemical coordination occur in plants?

Chemical control occurs in plants by chemicals called the ***plant hormones,*** which are also called Phytohormones or Plant Growth Regulators. These hormones *speed up of slow down the growth* of the plants.

a. Auxins control the tropic (growth related) movements of the plants in response to light, gravity, touch etc by *increasing the size of cells*. Under the influence of Auxins the plant stem bends towards unidirectional light where as the roots bend away from it.

b. Gibberellins stimulate stem elongation and leaf expansion. Its application causes stem elongation in small •rosette€ plants such as cabbage. Spraying sugarcane plant with gibberellins increases the stem size thus increasing the yield.

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23. What is the need for a system of control and coordination in an organism?

A living organism has to interact with different factors in the environment. These may be light, temperature, food, water or any other thing. For proper interaction, with these factors of the environment *a system is needed that receives the information from outside, processes the information and incites a proper response in the organism*.

More over inside the body of the organism there are different organs and organ systems doing different functions. There should be coordination between these organs and organ systems so that they interact and complement each other€s functions. Hence, again *there is a need of such a system, which can coordinate the functions of different organs and organ systems* so that normal state of the body is maintained (which is called homeostasis).

Thus, to enable the organism to deal with external factors as well as internal functions of the body a system is needed that can control and coordinate them.

24. How are involuntary actions and reflex actions different from each other?

Involuntary actions and reflex actions are two different types of actions.

Involuntary actions on the one hand are such actions, which are not under the control of our will. For example, the movement of iris muscles to adjust the size of the pupil of the eye is an involuntary action. Similarly, the movement of the ciliary muscles of the eyes to adjust the curvature of the eye lens is again an involuntary action. These actions are controlled by motor nerves arising from the *brain*. Involuntary actions are *not meant for sudden response in any emergency situation*.

Reflex actions on the other hand are actions *towards emergency situations*. For example, if a person accidentally touches a hot object he withdraws his hand instantly without being aware of his action for a fraction of a second. Reflex action is controlled by the reflex arc in which sensory nerves pass on the signals to the motor nerves in the spinal cord. There is no involvement of thought process in it. Thus reflex action may be considered as a short cut between stimulus and response to save time.

25. Compare and contrast nervous and hormonal mechanisms for control and coordination in animals.

S.No	Nervous Control	Hormonal Control
1.	Nervous control is through electric signals produced and conducted by the nerve cells of the nervous system.	Hormonal control is by the specialized chemicals called Hormones produced by the Endocrine glands.
	Nerve signals can reach only up to those	The hormones are carried by the blood to

2.	parts or cells of the body which are connected by nerves. That is that are localized in nature.	the target organs and so can reach to every cell of the body.
3.	Nerve signals are localized in nature i.e., they can reach only to those parts of the body that are connected by the nerves.	Hormonal control is wide spread in the body and can reach practically every cell of the body.
4.	Nervous responses are very fast responses because nerve impulses travel fast and cause quick action.	Hormonal responses are slow because hormones are produced in very less quantity and have to be transported by the blood to the site of action.
5.	Nerve responses last for a very short time and new nerve signals have to be generated and sent to repeat the response.	Hormonal responses last for a very long time. Hormones produced in very less quantities can continue the response for a long time.

26. What is the difference between the manner in which movement takes place in a sensitive plant and the movement in our legs?

S.No	Movement in leaf of the sensitive plant	Movement in our legs
1.	It occurs due to pressure changes in the parenchyma cells of the leaf due to loss of water by exosmosis.	It occurs due to contraction of skeletal muscles of the legs.
2.	The signal is not transmitted in the leaf through nervous system as it is absent in plants.	The signal for contraction of muscles comes through the nerves. It is a well thought of action by the brain.
3.	It takes in a fixed direction and manner and cannot be changed.	The movement of legs is controlled by brain and can take place in the desired direction.
4.	It is comparatively slower than muscle action taking place in the legs.	Muscle action in the legs is comparatively faster than movement of the leaf.

Extra Questions

1. What are the systems for control and coordination in higher animals?

In higher animals, there are two systems for control and coordination. These are-

a. *Nervous system*- It consists of-

i. Sense organs- eyes, ears, nose, tongue and skin. The sense organs receive signals from the environment and generate electric impulse that is sent to the brain.

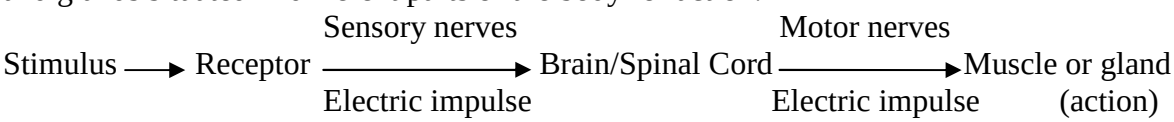
ii. Sensory nerves- these are nerves, which carry electric impulse from the sense organs to the brain.

iii. The Central Nervous System- The CNS consists of the Brain and Spinal Cord.

The brain receives the electric impulses and thinks over them to incite proper action. It sends signals to the work organs and glands of the body through motor nerves for action. It also stores experiences in the form of memory.

The Spinal Cord acts as an intermediate between brain and different parts of the body. The spinal cord receives impulses from various parts of the body and sends them to the brain. It also relays signals going from the brain to different muscles and glands of the body for action.

iv. Motor nerves- these are nerves that carry the signal from the brain and spinal cord to muscles and glands situated in different parts of the body for action.



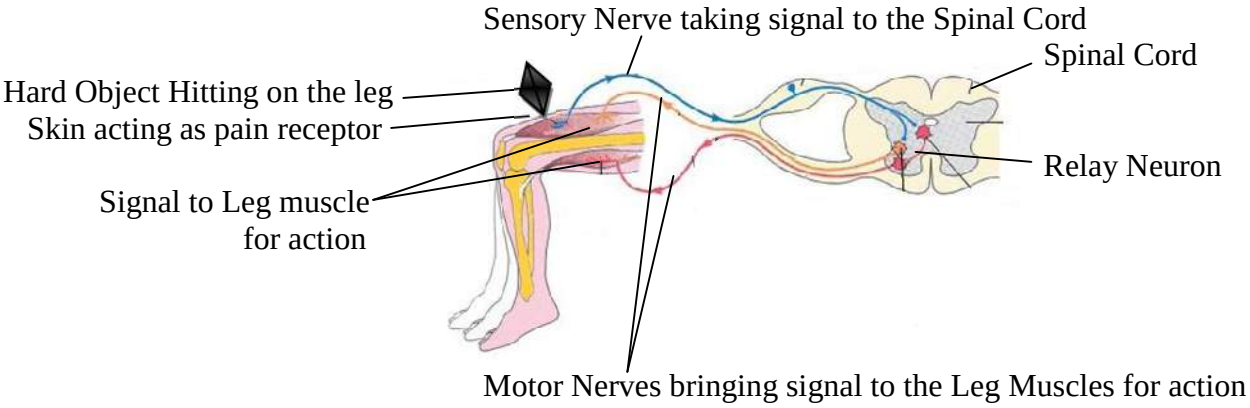
b. *Endocrine system*- It consists of Endocrine glands, that produce chemicals called Hormones. These hormones are produced in very little amounts and released into the blood plasma. The blood transports hormones to the site of action. These hormones control various functions of the

body. For example, Insulin hormone produced by the Pancreas gland controls the amount of glucose in the blood.

2. What is reflex action? Explain giving an example. What is reflex arc?

Reflex action is a quick action in response without involvement of the thought process. It is controlled through the spinal cord in which transfer of impulse takes place from sensory neuron to the motor neuron. *The path through which the signal travels during reflex action is called the reflex arc*. As the reflex arc is a shorter route reflex action takes place in a fraction of a second.

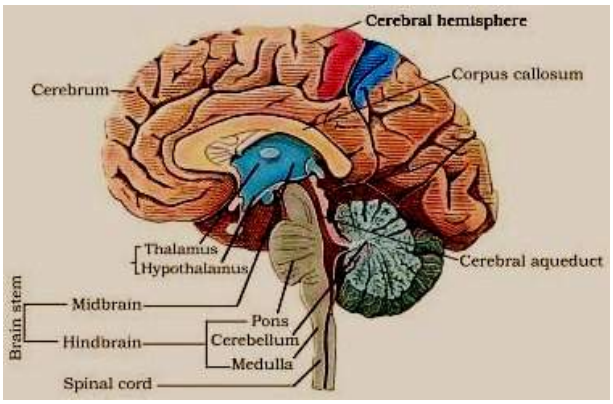
For example, if a person accidentally hits something on the leg, the pain receptors in the skin receive the pain and generate an electric signal. This impulse is sent by the sensory neuron to the spinal cord. In the spinal cord the impulse is transferred quickly to the motor neuron, which relays it to the leg muscles for quick action.



The above Reflex Arc can also be shown as follows-

Stimulus → Receptor (Eg. Skin) —Sensory nerves (Electric impulse)→ Spinal Cord —Motor nerves (Electric impulse)→ Muscle or gland (action)

3. Draw a well labeled diagram of the human brain and mention the functions of its various parts.



Human brain is divided into three parts-
Fore Brain, Mid Brain and Hind Brain.

a. The Fore Brain- It is the largest part of the brain. It consists of the following parts-

i. *Cerebrum*- *It is the most important and largest part of the fore brain*. It is divided into two halves called the Cerebral Hemispheres. The two hemispheres are connected by a tract of nerve fibres called Corpus Callosum. Each hemisphere has many convulsions (folds) to increase the surface area of the Cerebrum. The functions of Cerebrum are-

- Receiving Sensory signals from various sense organs and receptors. There are separate sensory areas to receive sensory signals of hearing, smell, sight etc.
- Analysis of the sensory signals in the association areas and thinking of a proper response.
- Sending response signals (motor signals) to the muscles through the motor areas.
- Storing memory of different experiences and using this memory to generate proper responses.
- It is the seat of understanding language, memory, knowledge and logical thinking.

ii. *Thalamus*- It is situated underneath (i.e., below) the Cerebrum.

- Its function is to coordinate the incoming sensory signals to the Cerebrum and outgoing motor signals from it.

iii. *Hypothalamus*- It is situated under the Thalamus. Its functions are-

- It controls many of the body€s important activities and feelings such as hunger, thirst, temperature regulation, sleep, emotional behavior and sexual activity.
- It produces and secretes hormones that control the functioning or the pituitary gland situated just below it.
- It also controls the function of internal body organs by means of the autonomic nervous system.

b. The Mid Brain- It is the topmost structure of the brain stem.

- It has centers relating to pain, temperature and touch.
- It controls many involuntary actions of the body.
- It has a collection of cells that control functioning of eyes and ears.

c. The Hind Brain- It consists of the Pons, Cerebellum and Medulla Oblongata.

i. *Pons*- It is a bulging structure situated below the Mid Brain. It consists of large bundles of nerve fibres that interconnect different regions of the brain.

ii. *Cerebellum*- It is located at the lower back side of the brain under the cerebrum. Its functions are as follows-

- Maintaining the posture and balance of the body by controlling the muscles.
- It also controls the voluntary actions of the body by controlling motor signals coming from the Cerebrum.

iii. *Medulla Oblongata*- It is long stalk like lowermost portion of the brain stem. At the lower side it is connected with the Spinal Cord. It controls many involuntary actions such as salivation, vomiting, blood pressure, respiration and heart beat.

4. What are tropic movements in plants? Explain giving examples.

*The **directional growth movements** in plants due to unidirectional stimuli like light, gravity, touch etc, causing the bending of stem or root in the direction of the stimulus are called tropic movements*. The examples of tropic movements are:

a. Phototropism: The bending of the plant stem or root due to the effect of unidirectional light is called phototropism. Plant stems are positively phototrophic, i.e., they bend towards unidirectional light. This helps the plant to get more sun light for photosynthesis. Phototrophic response is due to Auxin hormone, which is produced in the stem tips. This hormone diffuses down into the stem and causes more cell elongation in the darker side of the stem. This causes the stem to bend in the direction of light.

Plant roots are negatively phototrophic i.e., they tend to bend away from the light.

b. Geotropism: The roots of plants bend down and grow towards the soil due to gravity. This is called geotropism. This is due to the effect of Auxin hormone, which is produced in the tip of the roots and causes cell elongation in the root cells which are on the side *away* from soil. This causes the roots to bend down towards the soil.

Plant stems are negatively geotropic i.e., they tend to grow away from the soil.

c. Hydrotropism: Roots of plants bend and grow towards the part of soil which has higher moisture (water). This is called hydrotropism. Plant roots show stronger hydrotropism than geotropism. Thus, the roots show more tendency to grow towards water rather than towards gravitational pull of the earth.

d. Chemotropism: This tropic movement is shown by the pollen tubes that bend and grow through the style. This is due to the chemicals that are present in the style and stimulate the pollen tube to grow downwards. Many fungi show chemotropism by growing towards food containing sugars and other nutrients.

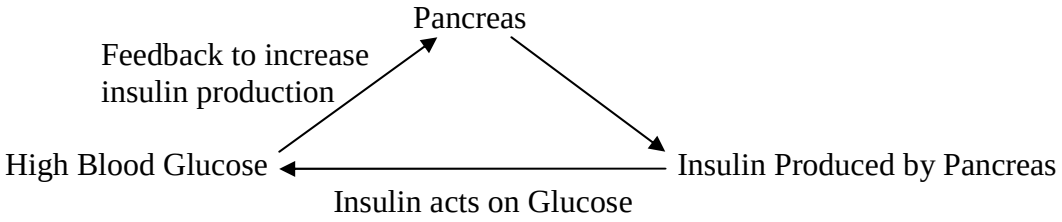
e. Thigmotropism: The bending of plant parts due to contact (touch) is called thigmotropism. It is seen in plant tendrils, which coil around the object and take support in climbers. For example, thigmotropism is seen in pea tendrils. The bending of the tendrils is under the control of Auxin hormone which causes unequal growth by cell elongation in the part of the tendril away from the support.

5. What is feedback mechanism in hormonal control? Explain giving example.

The functioning of the Endocrine gland to produce a hormone is controlled by feedback mechanism. If the hormone is needed the Endocrine gland gets a signal to start producing it in larger amounts. Once the hormone is produced in sufficient amounts, the gland slows down the production of the hormone. In this way the amount of hormone is controlled in the body.

For example-

a. Pancreas produces the hormone Insulin which lowers the blood glucose level. Normally pancreas produces less amounts of insulin. But when blood glucose level increases (after having food), pancreas gets a signal to increase insulin production. It produces more insulin, to lower the blood glucose and bring it to normal level. As the blood glucose level decreases insulin production is also reduced by the pancreas.



b. The Pituitary gland produces a hormone called Thyroid Stimulating Hormone to stimulate the Thyroid gland. The Thyroid gland gets stimulated by the hormone and produces its own hormone Thyroxin. Once Thyroxin is produced in sufficient amount, it gives a feedback signal to the Pituitary gland to decrease the production of Thyroid Stimulating Hormone so that Thyroid gland can also decrease the production of Thyroxin.

When Thyroxin level in the body decreases, the Pituitary gland again increases the production of Thyroid Stimulating Hormone.