

THP

COACHING CLASSES

Chapter 1: Life Processes

- **Life:** The ability of an organism to reproduce, grow, produce energy through chemical reactions to utilize the outside materials.
- **Life Processes:** All the processes which together keep an organism alive and perform the job of the body maintenance is called as life processes.

The basic life processes are:

1. Nutrition
2. Respiration
3. Circulation
4. Excretion

Nutrition: The process of taking of food by an organism and the utilization by the body is called as nutrition.

Types of Nutrition:

- **Autotrophic Nutrition**
 - **Heterotrophic Nutrition**
 - Holozoic Nutrition
 - Saprophytic Nutrition
 - Parasitic Nutrition
- ❖ **Autotrophic Nutrition:** It is a nutrition in which organism prepares their own food from simple inorganic substances like carbon dioxide and water in the presence of sunlight and chlorophyll. Example: All green plants and some bacteria.
- ❖ **Heterotrophic Nutrition:** It is nutrition in which organisms get their food directly or indirectly from plants. Example: All animals, fungi, and some bacteria.
1. **Holozoic Nutrition:** Holozoic nutrition is nutrition in which organism take food directly and then digest and absorb it. Example: Amoeba, Paramecium, Birds, and Humans.

THP

COACHING CLASSES

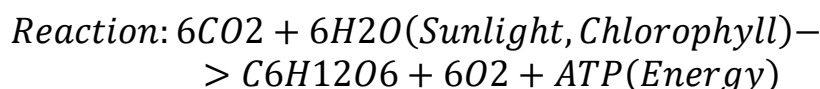
2. **Saprophytic Nutrition:** Saprophytic nutrition is nutrition in which organisms take their food from dead and decaying substances. They breakdown the food material outside their body and then absorb it. Example: Mushroom, Mould, Yeast, and some bacteria.

3. **Parasitic Nutrition:** Parasitic nutrition is nutrition in which organism get their food from living organisms (host) without killing them. Example: Cuscuta, Tapeworm, Plasmodium, Leeches.

Photosynthesis: Photosynthesis is the process where chloroplast of the green leaves synthesizes sugar by using carbon dioxide and water in the presence of sunlight.

Raw materials of photosynthesis:

1. H_2O
2. CO_2
3. Chlorophyll
4. Sunlight



Mechanism of Photosynthesis:

1. Sunlight is absorbed by chlorophyll.
2. Photolysis of water.
3. Reduction of CO_2 into Glucose.

Stomata: Stomata are tiny pores in the leaves through which exchange of gases takes place. Each stomata has a pair of guard cells which controls the opening and closing of the stomata - cell move. When water enters the guard cells, it swells and the pore opens; when guard cells lose water, it shrinks and the pore closes.

Functions of Stomata:

1. Exchange of gases.
2. Transpiration - Loss of water in the form of vapor.

THP

COACHING CLASSES

Nutrition in Amoeba: Amoeba is a unicellular organism living in water; it takes food by forming finger-like projections called pseudopodia and forms a food vacuole. Inside the food vacuole, the food is digested and absorbed the undigested food is then sent out through the surface of the cell.

Nutrition for Paramecium: Paramecium is also a unicellular organism. Its whole body surface bears cilia. Food is captured by a specific point (cytostome).

Nutrition in Human Beings:

Nutrition in Animals takes place by following processes:

1. Ingestion
2. Digestion
3. Absorption
4. Assimilation
5. Egestion

Digestion: Conversion of complex and insoluble food material into simple and soluble food materials by physical and chemical processes is called as digestion.

Human Digestive System: Consists of Alimentary canal and Associate glands.

Alimentary Canal:

1. **Mouth and Buccal Cavity:** Buccal cavity is the space where the food is chewed, softened, and mixed with saliva. It's opening is called mouth. Buccal cavity contains teeth and tongue.
 - **Teeth:** Teeth are the hardest non-boney structure. It is made up of calcium and phosphate. Human teeth are of four types:
 - a) Incisors
 - b) Canine
 - c) Premolars
 - d) Molars

Dental Formula:

- In Adults: $2123/2123 \times 2 = 32$ (Teeth)

THP

COACHING CLASSES

- In Children: $2102/2102 \times 2 = 20$ (Teeth)
- **Tongue:** Tongue is the skeletal muscular organ, there are many taste buds to taste food. Tongue helps in mixing of food to saliva.
- **Glands:** Buccal cavity contains 3 pairs of salivary glands which secrete saliva. These are two types of enzymes which are present in saliva:
 - **Lysozyme:** It kills bacteria which are present in food.
 - **Salivary Amylase / Ptyalin:** It converts starch (carbohydrate) into maltose.
- 2. **Pharynx:** It is the common passage for air and food, it connects buccal cavity to esophagus.
- 3. **Esophagus:** Esophagus is about 25 cm long tube connecting the stomach.

Peristalsis: Peristalsis is the process of contraction and relaxation in the wall of esophagus. It helps in the movement of food in esophagus to stomach.

- 4. **Digestion in Stomach:** Stomach is an elongated, muscular bag. It lies below the diaphragm. The lining of stomach contains numerous gastric glands. The glands produce gastric juice which contains the enzyme - pepsin, HCl and mucus.

Pepsin: Breaks down proteins.

Hydrochloric Acid: Makes the medium acidic and helps in the action of pepsin.

Mucus: Protects the wall of stomach from the action of the acid.

- 5. **Digestion in Duodenum:** In the upper part of the small intestine (duodenum), the food is mixed bile from liver and pancreatic juice. Pancreatic juice contains the enzyme Trypsin and Lipase. Trypsin breaks down protein and Lipase break down fat.
- 6. **In the Small Intestine:** The glands present in the walls of small intestine produce Intestinal juice. The enzyme of Intestinal juice

THP

COACHING CLASSES

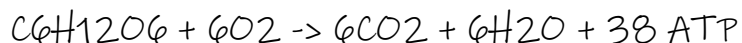
converts carbohydrate into glucose, fat into fatty acid and glycerol, and protein into amino acids.

The wall of the small intestine has several finger-like projections called villi having blood vessels. It helps to increase the surface area for the absorption by the blood and transported to all cells in the body. Then undigested food passes into large intestine.

7. **In the Large Intestine:** Where the water is absorbed and then waste material is removed through anus.

Respiration:

Respiration is the process by which the food is burnt in the cells of the body with the help of oxygen to release energy.



Respiration involves two steps:

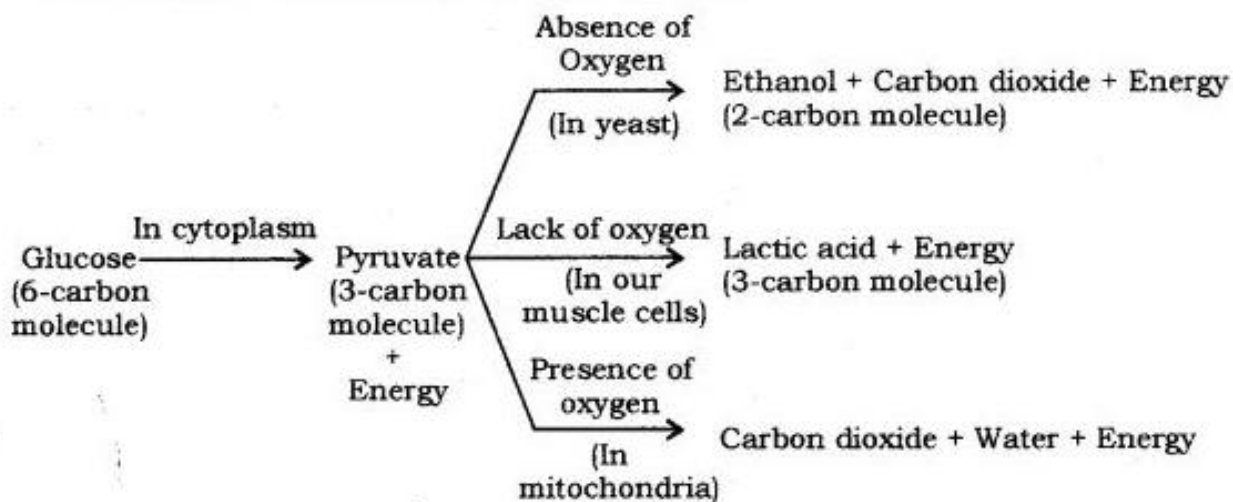
1. Breathing
2. Cellular Respiration

- ❖ **Breathing:** Intake of oxygen and release of carbon dioxide in environment is called breathing.
- ❖ **Cellular Respiration:** Breakdown of food (glucose) and formation of energy in cell is called cellular respiration.

Glycolysis: Glycolysis is a catabolic process in which glucose breaks in the presence of oxygen and forms energy.

THP

COACHING CLASSES



Respiration

Aerobic

- Takes place in the presence of oxygen.
- Occurs in mitochondria.
- End products are CO_2 and H_2O .
- More amount of energy is released.
- Equation :

$$\text{Glucose} \rightarrow \text{Pyruvate} \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{Energy}$$

Anaerobic

- Takes place in the absence of oxygen.
- Occurs in cytoplasm.
- End products are alcohol and lactic acid.
- Less amount of energy is released.
- Equation :
 In Yeast :

$$\text{Glucose} \rightarrow \text{Pyruvate} \rightarrow \text{Ethanol} + \text{H}_2\text{O} + \text{Energy}$$
- In Muscle Cell :

$$\text{Glucose} \rightarrow \text{Pyruvate} \rightarrow \text{Lactic acid} + \text{Energy}$$

THP

COACHING CLASSES

2- CONTROL AND COORDINATION

Stimuli :- The changes in the environment to which living organisms respond are called stimuli. Eg :- heat, cold, sound, smell, taste, touch, pressure, gravity, water etc. Living organisms respond to stimuli in the form of body movements.

Coordination :- For a proper response to a stimulus many organs in the body should work together. The working together of various organs in an organism to produce a proper response to a stimulus is called coordination.

- i) In animals control and co ordination is done by the nervous system and endocrine system.
- ii) In plants control and co ordination is done by chemical substances called plant hormones or phytohormones.

Coordination in animals :-

In animals control and co ordination is done by the nervous system and endocrine system.

The nervous system consists of the brain, spinal cord and nerves.

a) Receptors :- are the sense organs which receive the stimuli and pass the message to the brain or spinal cord through the sensory nerves.

Eg :- **Photoreceptors** in the eyes to detect light.

Phonoreceptors in the ears to detect sound.

Olfactory receptors in the nose to detect smell.

Gustatory receptors in the tongue to detect taste.

Tangoreceptors in the skin to detect touch.

b) Effectors :- are the muscles and glands which respond to the

THP

COACHING CLASSES

information from the brain and spinal cord through the motor nerves.

c) Sensory nerves :- are nerves which carry information from the receptors (sense organs) to the brain and spinal cord.

d) Motor nerves :- are nerves which carry information from the brain and spinal cord to the effectors (muscles and glands).

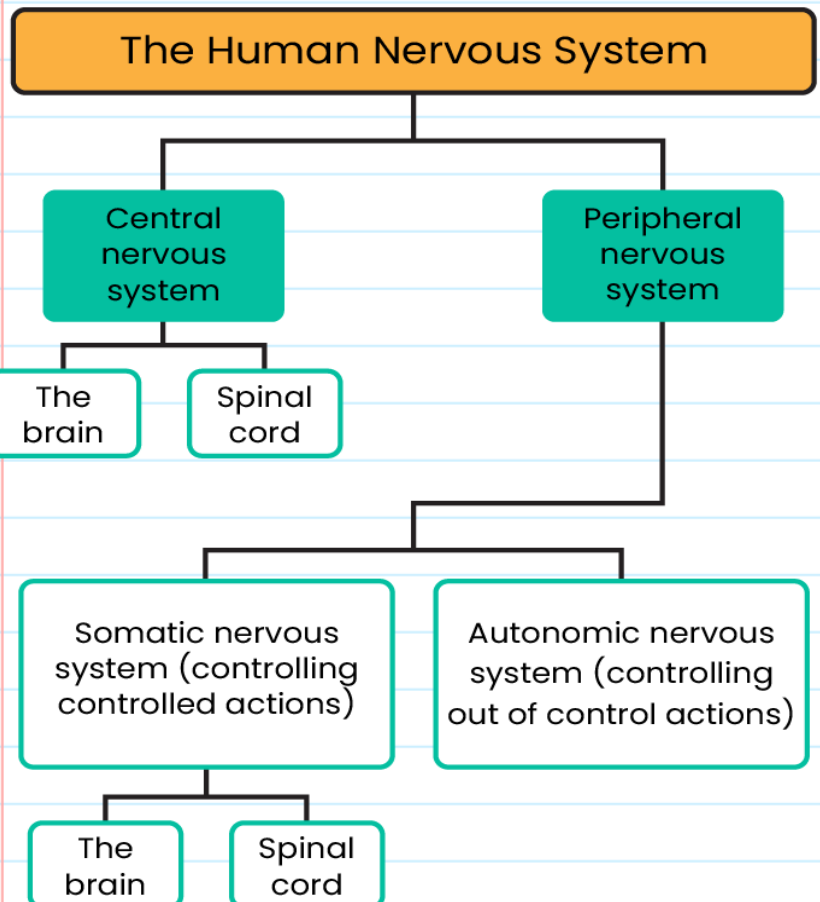
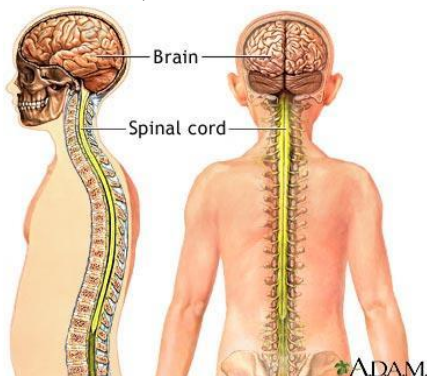
Human nervous system :-

a) Parts of the nervous system :-

The human nervous system consists of the Central Nervous System and Peripheral Nervous System.

i) The central nervous system :- consists of the brain, and spinal cord.

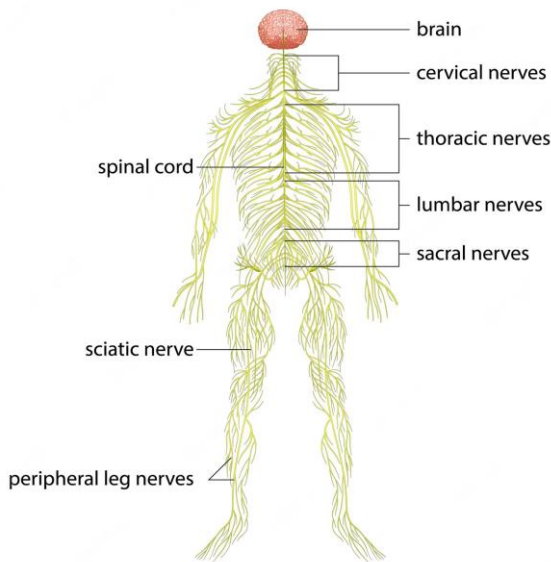
ii) The peripheral nervous system:- consists of cranial nerves arising from the brain and spinal nerves arising from the spinal cord.



THP

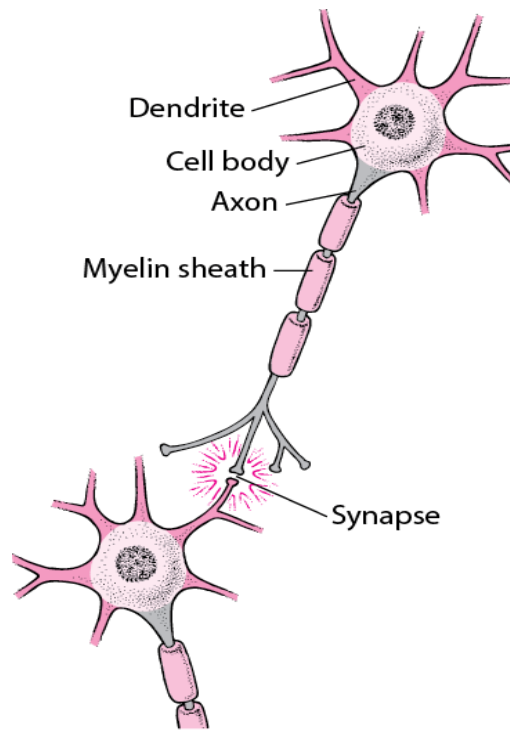
COACHING CLASSES

Human Nervous System



containing a nucleus and has several branched called dendrites. It has a fibre called axon which is protective covering called sheath. The junction neurons is called synapse.

Messages pass through the nerve cell in the form of chemical and electrical signals called nerve impulse. The dendrites receive the information and starts a chemical reaction which produce electrical impulse which passes through the axon.



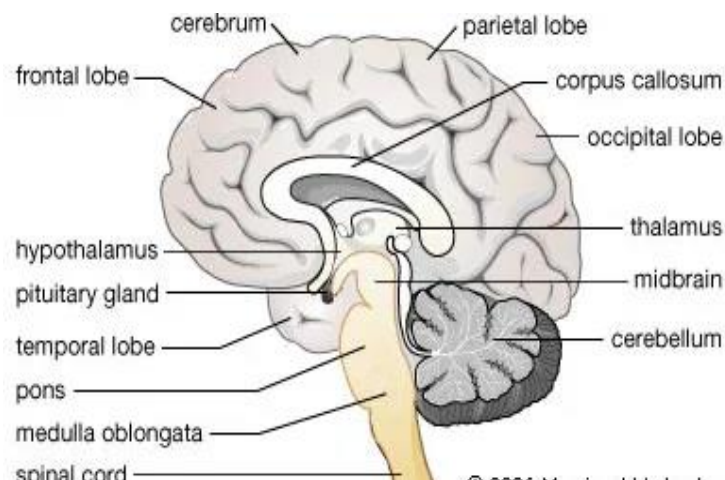
Nerve cell (Neuron) :-

Neuron is the structural and functional unit of the nervous system. It has a cell body called cyton cytoplasm. It structures long nerve covered by a Myelin between two

Brain :-

The brain is the main **coordinating centre** in the human body. It is protected by the **cranium**. It is covered by three membranes called **meninges** filled with a fluid called **cerebrospinal fluid** which protects the brain from shocks.

The brain has three main parts. They are fore brain, mid brain and hind brain.



THP

COACHING CLASSES

i) Fore brain :- consists of the cerebrum and olfactory lobes. It is the thinking part of the brain and controls voluntary actions. It controls touch, smell, hearing, taste, sight, mental activities like thinking, learning, memory, emotions etc.

ii) Mid brain:- controls involuntary actions and reflex movements of head, neck, eyes etc.

iii) Hind brain :- consists of cerebellum, pons and medulla.

Cerebellum :- controls body movements, balance and posture.

Pons :- controls respiration.

Medulla :- controls heart beat, blood pressure, swallowing, coughing, sneezing, vomiting etc.

Spinal cord :-

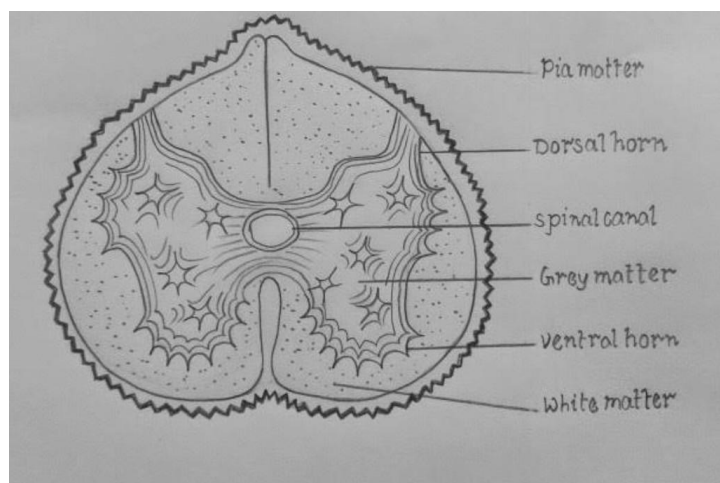
The spinal cord starts from the brain and extends through the vertebral column. It has 31 pairs of spinal nerves. It carries messages to and from the brain. It also controls reflex actions.

a) Reflex action :-

Reflex action is a sudden, unconscious and involuntary response of the effectors to a stimulus.

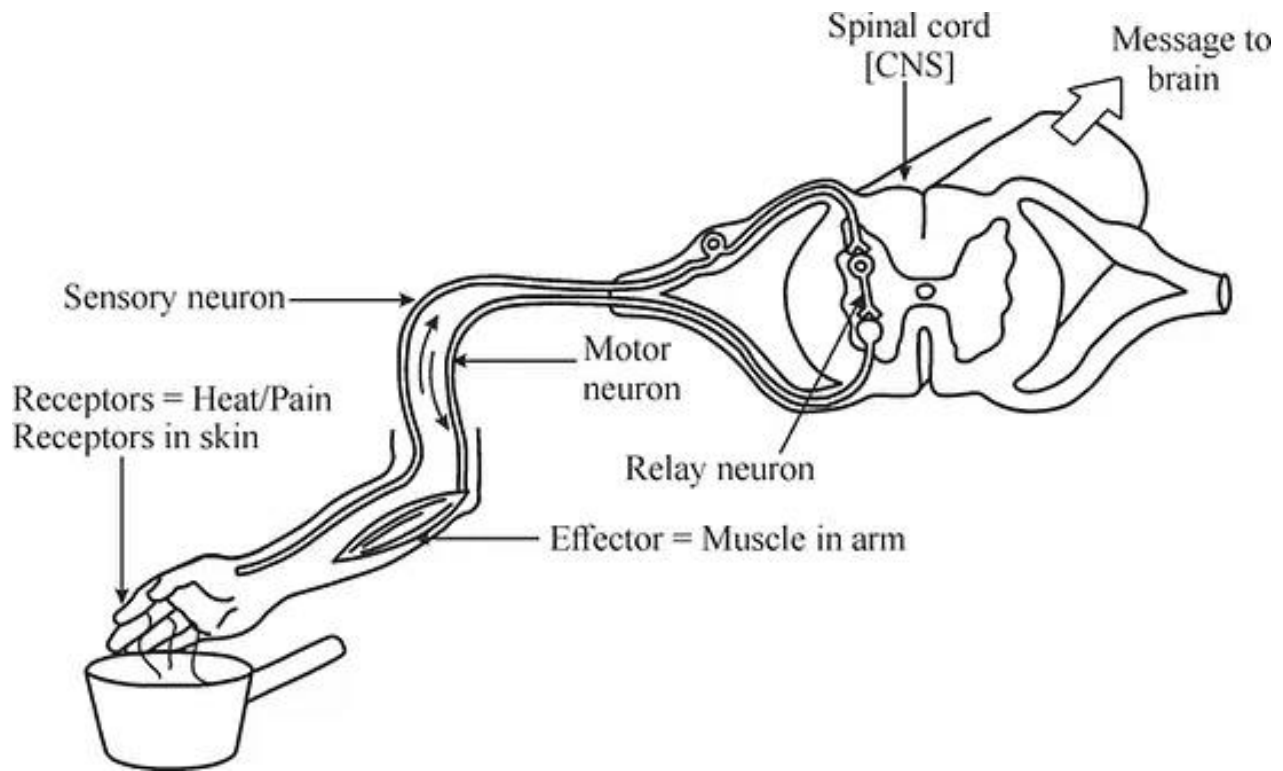
Eg :- We suddenly withdraw our hand if we suddenly touch a hot object.

In this reflex action, the nerves in the skin (receptor) detects the heat and passes the message through the sensory nerves to the spinal cord. Then the information passes through the motor nerves to the muscles (effector) of the hand and we withdraw our hand.



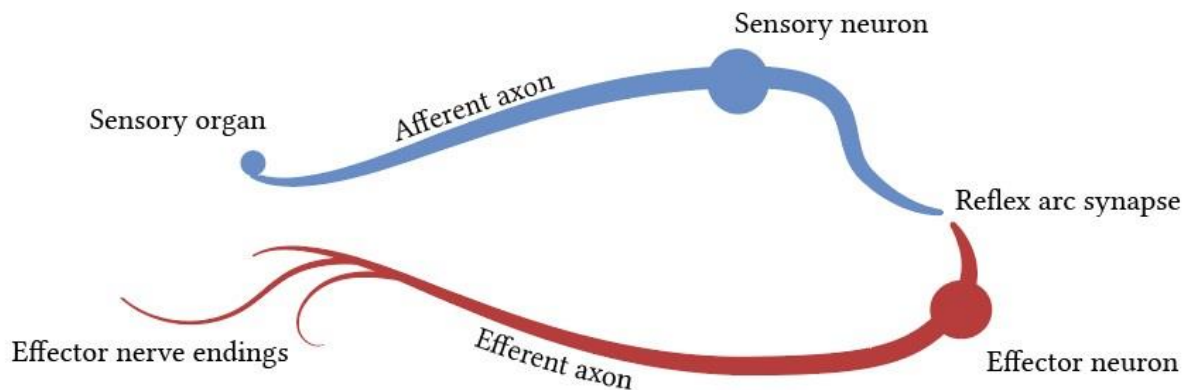
THP

COACHING CLASSES



b) Reflex arc :-

The pathway of a reflex action is called reflex arc. In a reflex arc the stimulus is received by the receptors (sense organs) and it passes through the sensory nerves to the spinal cord. From the spinal cord the information passes through the motor nerves to the effectors (muscles/glands) for the response.



THP

COACHING CLASSES

Control and Coordination in plants :-

The plants do not have a nervous system and sensory organs like eyes, ears and nose as animals have but they can still sense things.

The plants coordinate their behaviour against environmental changes by using hormones because they don't have a nervous system.

The plants respond to various stimuli very slowly by growing so in most cases plant response cannot be observed immediately.

The function of coordination in plants is performed by plant hormones called phytohormones.

Phytohormones

Phytohormones are chemicals produced by plants that regulate their growth, development and reproductive processes.

There are 4 major types of plant hormones which are involved in the control and coordination in plants.

- i. Auxins
- ii. Gibberellins
- iii. Cytokinins
- iv. Abscissic acids
- v. Ethylene

Auxins -

Auxins are plant hormones which promote cell enlargement and cell differentiation in plants.

Auxins also promote fruit growth.

Auxin hormone controls a plant's response to light and growth gravity. In other words, auxin hormone is responsible for phototropic and geotropic responses of plants.

Gibberellins-

Gibberellins are plant hormones which promote cell enlargement and cell differentiation in the presence of auxins.

Gibberellin helps in breaking the dormancy in seeds and buds and promotes growth in fruits.

Cytokinins -

Cytokinins promote cell division in plants.

THP

COACHING CLASSES

It help in breaking the dormancy of seeds and buds. They delay the ageing in leaves. Cytokinin's promote the oppening of stomata. They aslo promote fruit growth.

Absciscic acid -

It is a growth Inhibitor. Absasic acid (ABA) promotes the dormancy in seed and Buds. It aslo promotes the closing of stomata. It promotes the falling of leaves.

Ethylene -

Ethylene is a group of plant growth regulators which are widely used for ripening fruits and for the production of more flowers and fruits.

6) Movements in plants :-

Movements in plants are of two main types. They are :-Tropic movements and Nastic movements.

a) Tropic movements :- are directional movements towards or away from the stimulus and it depends on growth. They are of different types like Phototropism, Geotropism, Chemotropism, Hydrotropism ,Thygmotropism etc.

i) Phototropism :- is movement of plants in response to light. If it is towards light, it is called positive phototropism. Eg:- Bending of shoot towards light. If it is away from light, it is called negative phototropism. Eg:- Bending of root away from light.

ii) Geotropism :- is the movement of plants in response to gravity. If it is towards gravity it is called positive geotropism. Eg:- Downward growth of roots. If it is away from gravity it is called negative geotropism. Eg:- Upward growth of shoot.

iii) Chemotropism :- is movement of plant in response to chemical stimuli. Eg:- Growth of pollen tube towards the ovule.

iv) Hydrotropism :- is the movement of plants in response to water.
Eg :- Growth of roots towards water.

v) Thygmotropism:-The movement of plant in response to touch.
Eg:-Tendrils

b) Nastic movements :- are non directional movements which are neither towards or away from the stimulus and it does not depend on growth.

THP

COACHING CLASSES

Eg :- If we touch the leaves of touch me not plant, its leaves fold up and droops down immediately due to the change in the amount of water in the leaves. Depending upon the amount of water in the leaves, it swells or shrink.



Endocrine glands in human beings

The endocrine glands also help in control and coordination. The endocrine glands produce chemical substances which help to control and coordinate various activities in the body.

The endocrine glands in our body are :- pineal, hypothalamus, pituitary, thyroid, parathyroid, thymus, adrenal, pancreas, testes and ovary.

THP

COACHING CLASSES

Pituitary Gland

It is a pea-sized gland located at the base of the brain.

- It is the master gland, as it controls the secretions of all the other endocrine glands.
- It also secretes Growth Hormone (GH). Under-secretion of GH causes Dwarfism, and over-secretion causes Gigantism in children and 'Acromegaly' in adults.

Thyroid Gland

- It is a butterfly-shaped gland located in the throat.
- It secretes the hormone 'Thyroxine', which regulates the metabolism of the body.
- Iodine is required to synthesize thyroxine in the body.
- In the case of iodine deficiency, under-secretion of thyroxine leads to goitre.

Pancreas

- It is a leaf-like gland present behind the stomach in the abdomen.
- It is an endocrine as well as an exocrine gland.
- As an endocrine gland, it manufactures two hormones – Insulin and glucagon. Both these hormones act antagonistically and regulate the sugar level in the blood.
- As an exocrine gland, it secretes enzymes to break down the proteins, lipids, carbohydrates and nucleic acids in food.
- An insufficient amount of insulin from the pancreas leads to diabetes.

Adrenal Gland

- Occurs in pairs above each kidney.
- It decreases in size with age.

THP

COACHING CLASSES

- Secretes the hormone adrenaline, which helps in flight and fight response.
- Also secretes noradrenaline.

Gonads

- Gonads are the gamete-producing organs – testes in males and ovaries in females.
- The testes produce the male hormone testosterone, and the ovaries produce the female hormones oestrogen and progesterone.
- Testosterone and oestrogen help in producing gametes and are responsible for the sexual characteristics of males and females, respectively.
- Progesterone is the pregnancy hormone.

Other Endocrine Organs

- The other endocrine organs include the hypothalamus, parathyroid, pineal and thymus glands.

