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Notes of Ch 7 Control and Coordination| Class 10th Science

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Study Material and Notes of Ch 7 Control and Coordination Class 10th Scienc

Topics in the Chapter

- Introduction
- System for control and coordination in animals
- Nervous System
 - Receptors
- Neuron
 - Functioning of Neuron





- Types of Responses
- Need for Reflex Action
- Human Nervous System
- Human Brain
 - For-Brain
 - Mid-Brain
 - Hind-Brain
- Protection of Brain and Spinal Cord
- Coordination between Nervous and Muscular Tissue
- Limitation of Electric communication/Nervous System
- Chemical combination
- Coordination in Plants
 - Independent of growth
 - Dependent of growth
- Plant Hormones
- Hormones in Animals
 - Endocrine gland and their functions
- Importance of iodine
- Diabetes
 - Cause of Diabetes
 - Treatment of Diabetes
 - Feedback Mechanism

Introduction

- All the living organisms respond and react to changes in the environment around them.
- The changes in the environment to which the organisms respond and react are called **stim** such as light, heat, cold, sound, smell, touch etc.

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→ Both plants and animals respond to stimuli but in a different manner.

Systems for Control and Coordination in Animals

→ Control and Coordination in animals is done with the help of two main systems:

- (i) Nervous system
- (ii) Endocrine system

Nervous System

→ Control and coordination are provided by nervous and muscular tissues.

→ Nervous tissue is made up of an organized network of nerve cells or neurons which is specific for conducting information via electrical impulses from one part of the body to another.

Receptors

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

(i) Ear: It acts as phonoreceptors (receiving sound). It helps in hearing and maintaining the balance of body.

(ii) Eyes: It acts as photoreceptors (receiving light). It helps in seeing.

(iii) Skin: It acts as thermoreceptors (feels temperature). It helps in feeling heat or cold and touch.

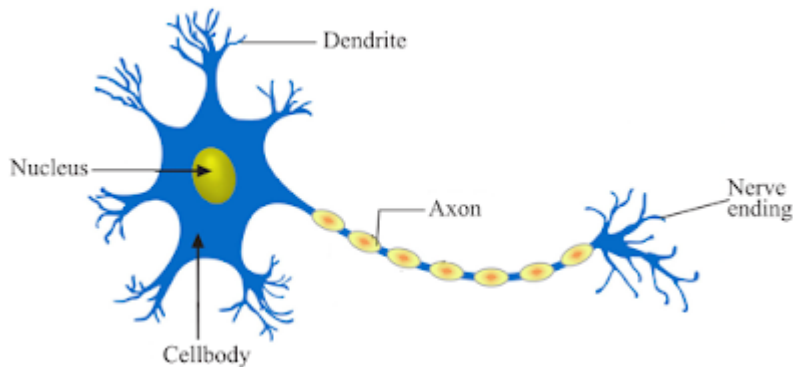
(iv) Nose: It acts as olfactory receptors (sense of smell). It helps in the detection of the smell.

(v) Tongue: It acts as Gustatory receptors (sense of taste). It helps in the detection of taste.





It is the structural and functional unit of nervous system.



Functioning of Neuron

→ The information from receptors is acquired at the end of the dendritic tip of a nerve cell as chemical reaction that creates an electrical impulse.

→ This impulse travels from the dendrite to the cell body and then at the end of the axon.

→ Chemicals are released at the end of the axon by the effect of electrical impulse.

→ These chemicals cross the gap (synapse) and start a similar electrical impulse in a dendrite of the next neuron.

→ The similar synapse finally allows delivery of such impulses from neurons to other cells, such as muscle cells or gland.

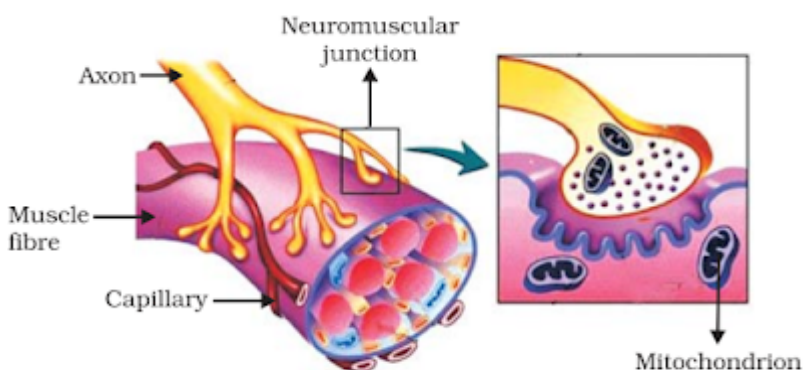


Fig: Neuromuscular junction

Parts of Neuron

(i) Dendrite: It acquires information.

(ii) Cell body: The information acquired by it travels as an electrical impulse.





Synapse: It is the gap between the nerve ending of one neuron and dendrite of the other neuron. Here, electrical signal is converted into chemical signal for onward transmission.

Reflex Action

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

Example: Knee jerk, withdrawal of hand on touching hot object.

→ **Stimulus:** It is observable or detectable change in the external or internal environment to which an organism reacts.

→ **Reflex arc:** The pathway through which nerve impulses pass during reflex action is called reflex arc.

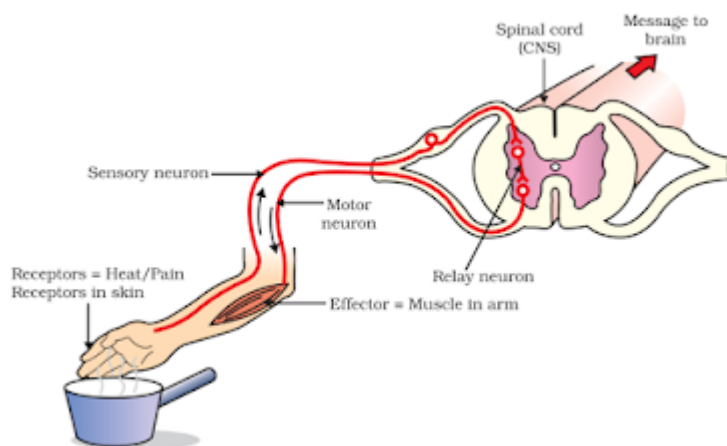
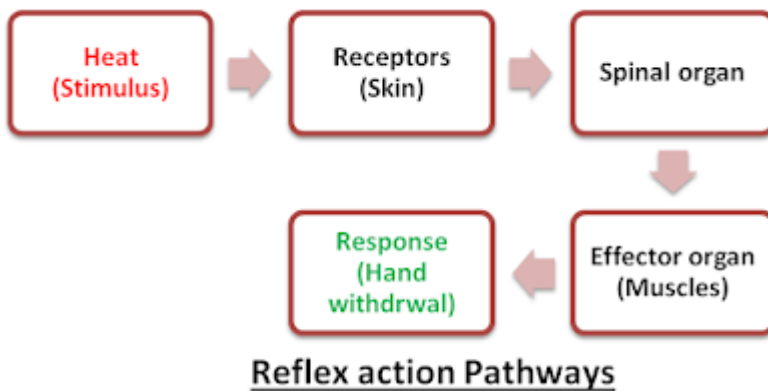
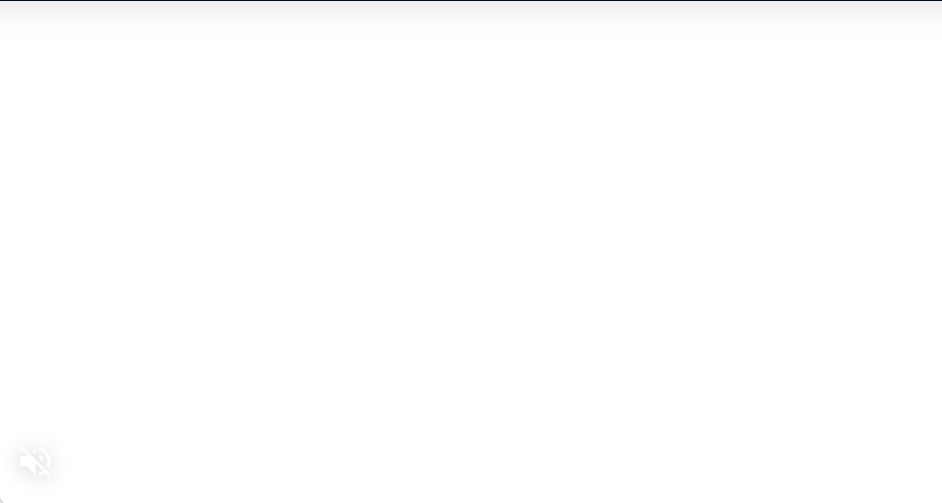


Figure 7.2 Reflex arc

→ Response: It is the final reaction after the reflex action.

Three types of responses:

(i) **Voluntary:** Controlled by fore brain. Example: talking, writing.



(iii) Reflex action: Controlled by spinal cord. Example: withdrawal of hand on touching a hot object.

Need for 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. In this way, time for taking action is reduced which saves us from injury.

Human Nervous System

→ Human nervous system consists of two parts, **Central nervous system (CNS)** and **Peripheral nervous system (PNS)**.

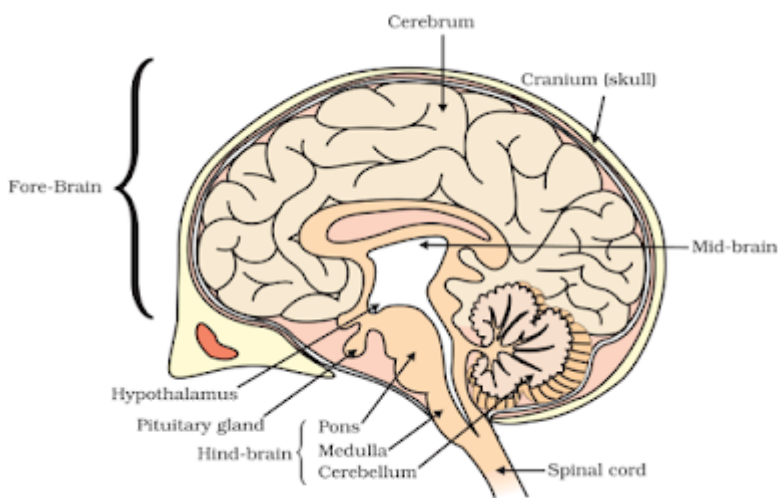
→ Central nervous system consists of **Brain** and **Spinal Cord**.

→ Peripheral nervous system consists of **Cranial Nerves** which arise from the brain and **Spinal Nerves** which arise from the Spinal cord.

Human Brain

→ Brain is the main coordinating centre of the body. It has three major parts:

- (i) Fore-brain
- (ii) Mid-brain
- (iii) Hind-brain



Fore-brain

→ It is the most complex or specialised part of the brain. It consists of cerebrum.

→ Functions of Fore-brain:

- (i) Thinking part of the brain.
- (ii) Control the voluntary actions.
- (iii) Store information (Memory).
- (iv) Receives sensory impulses from various parts of the body and integrate it.
- (v) Centre associated with hunger.

Mid-brain

→ Controls involuntary actions such as change in pupil size and reflex movements of head, neck and trunk.

Hind-brain





(ii) Medulla : Controls involuntary actions. Example: blood pressure, salivation, vomiting.

(iii) Pons : Involuntary actions, regulation of respiration.

Protection of Brain and Spinal Cord

→ Protection of Brain: Brain is protected by a fluid filled balloon which acts as shock absorber & is enclosed in cranium (skull or brain box).

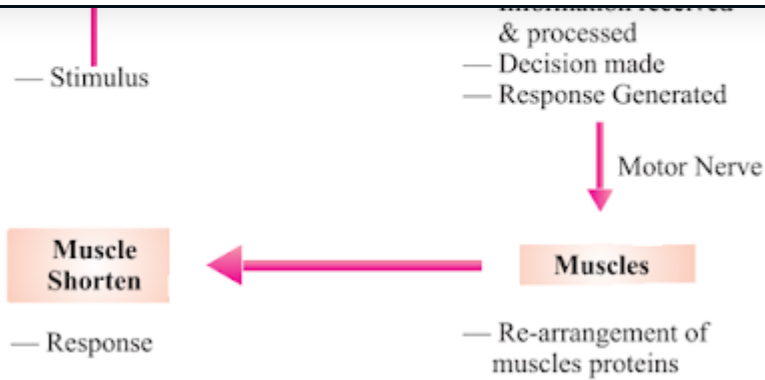
→ Protection of Spinal Cord: Spinal cord is enclosed in vertebral column.

Coordination between Nervous and Muscular Tissue

→ For taking place the voluntary actions, the brain has to send messages to muscles.

→ The communication between the central nervous system and the other parts of the body is facilitated by the peripheral nervous system consisting of cranial nerves arising from the brain & spinal nerves arising from the spinal cord.

→ The brain thus allows us to think and take actions based on that thinking. This is accomplished through a complex design, with different parts of the brain responsible for integrating different inputs and outputs.



Limitations of Electric communication/Nervous system

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

Chemical communication

→ It helps in overcoming the limitations of electric communication.

Coordination in Plants

→ There are three types of movements in plants.

- (i) Independent of growth
- (ii) Dependent on growth

Independent of growth

→ Independent growth has immediate response to the 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 of leaves of 'Touch-me-not' plant on touching it.





→ These movements are tropic movements i.e., directional movements in response to stimuli.

- **Tendrils:** The part of tendril away from the object grows more rapidly as compared to the part towards the object. This causes curling of tendril around the object.
- **Phototropism:** Movement towards light.
- **Geotropism:** Movement towards/away from gravity.
- **Chemotropism:** Growth of pollen tube towards ovule.
- **Hydrotropism :** Movement towards water.

Plant Hormones

→ These are chemical compounds which help to coordinate growth, development and response to the environment.

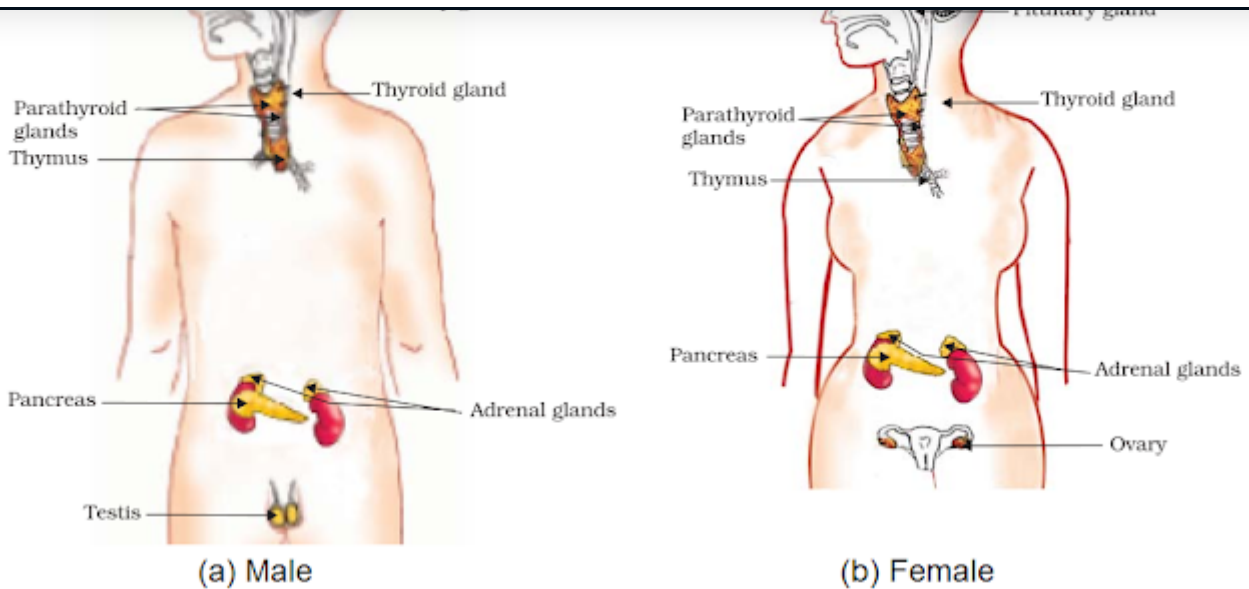
→ Main plant hormones are:

- **Auxin:** This hormone is synthesized at shoot tip. It helps the cells to grow longer and is involved in phototropism (response towards light).
- **Gibberellin :** It helps in the growth of the stem.
- **Cytokinins:** It promotes cell division. This is present in greater concentration in fruits and seeds.
- **Abscisic Acid:** It inhibits growth. It also causes wilting of leaves and is also known as stress hormone.

Hormones in Animals

→ 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 and the main organ for releasing the hormones.
- The list of endocrine glands with the hormones names and their functions are given below:



(i) Thyroxine: This hormone is secreted by Thyroid. The Thyroid is located in Neck/Throat region regulates the metabolism of carbohydrates, fats and proteins.

(ii) Growth hormones: This is secreted by Pituitary (master gland). This gland is located in Mid-It regulates growth and development.

(iii) Adrenaline: This hormone is secreted by Adrenal. The adrenal gland is located above both kidneys. It regulates blood pressure (increasing), heart beat, carbohydrate metabolism (during emergency).

(iv) Insulin: This hormone is secreted by Pancreas. The pancreas is located below stomach. It reduces and regulates blood sugar level.

(v) Sex hormones:

(a) Testosterone in males: This hormone is secreted by testis. The testis is located in genital area changes associated with puberty (Sexual maturity).

(b) Estrogen in females: This hormone is secreted by Ovaries. The ovaries are located in lower abdomen area. Its changes associated with puberty (Sexual maturity).

Importance of iodine

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 is a disease in which blood sugar level increases.

Cause of Diabetes

The disease is caused due to the deficiency of insulin hormone secreted by pancreas that is responsible to control blood sugar levels.

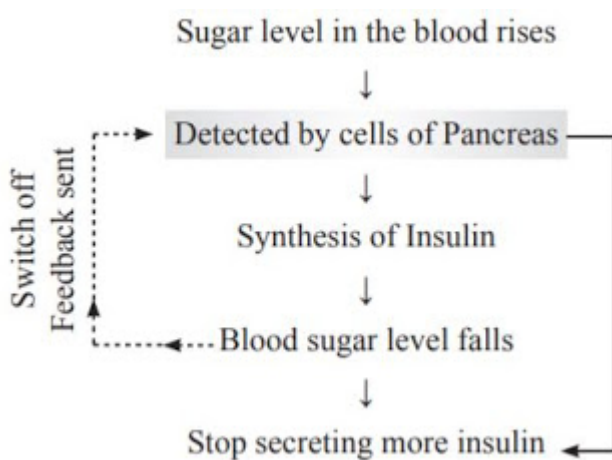
Treatment of Diabetes

Injections of insulin hormone can help in the treatment of diabetes.

Feedback Mechanism

→ The excess or deficiency of hormones has a harmful effect 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:



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