

LESSON 17-COORDINATION AND CONTROL: THE NERVOUS AND ENDOCRINE SYSTEMS

Every organism performs movements and a number of other tasks for its survival. Besides, several other actions are continuously occurring inside the body that need to be properly timed and coordinated. All this is the outcome of two organ systems – the nervous and the endocrine (hormonal) systems.

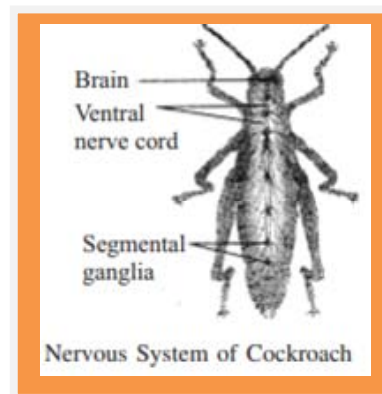
Some Basic Terms

- **Stimulus:** an agent or a sudden change of the external or the internal environment that results in a change in the activities of the organism.
- **Impulse:** a wave of electrical disturbance that travels across the nerve cell and its fibre.
- **Response:** a change in the activity of the organism caused due to stimulus.
- **Receptors:** The nerve cells which on receiving the stimulus, set up wave of impulses towards the central nervous system (brain and spinal cord).
- **Effectors:** muscles or glands, which on receiving the impulse from the brain or spinal cord contract or secrete substances.
- **Nerve:** A bundle of axons (nerve fibres) of separate neurons connecting the central nervous system with other parts of the body.
- **Sensory (afferent) nerve or the cell:** bringing the impulse from the receptor (sensory organ) to the main nervous system.
- **Motor (efferent) nerve or the cell:** Carrying the impulse from the main nervous system towards a muscle or a gland.

NERVOUS SYSTEM

- Nervous system basically consists of two parts: (i) Central nervous system (ii) Peripheral nervous system
- The nervous system is composed of the central nervous system (brain and spinal cord) and the peripheral nervous system (cranial and spinal nerves and the autonomic nervous system).

- The nervous system of **cockroach** is made of brain or supra-oesophageal ganglion, A sub-oesophageal ganglion lies below the oesophagus and is formed. The brain gives off a pair of short and stout circumoesophageal connectives that meet the sub-oesophageal ganglion.
- A double ventral nerve cord extends from the sub-oesophageal ganglion.
- It bears three thoracic and six abdominal ganglia

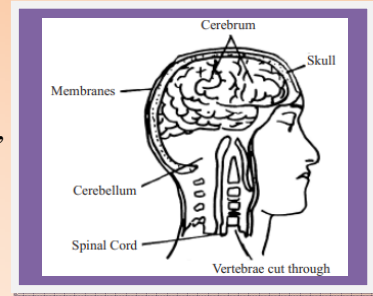


NERVOUS SYSTEM OF HUMANS

The central nervous system of humans includes a highly developed brains and spiral cord.

The **brain** is a very delicate organ lodged inside the cranium of the skull. The brain consists of three main regions:

1. forebrain consisting of cerebrum and diencephalon,
2. midbrain a small tubular part between the fore and the hindbrain,
3. Hindbrain consists of cerebellum, pons, and medulla oblongata



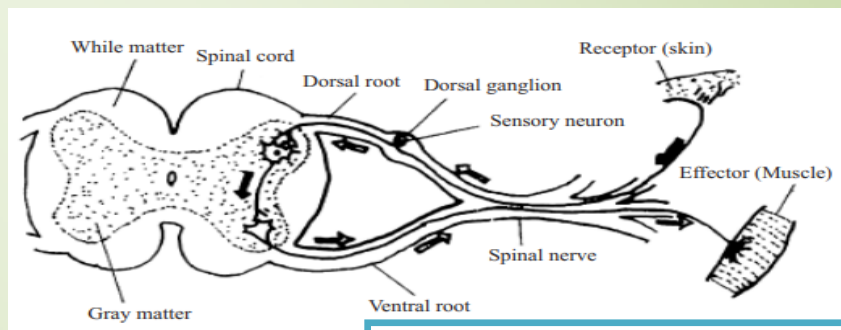
Cerebrum: This is the largest part of the brain divided into two (the right and the left) parts called cerebral hemispheres.

Diencephalon: This is the part of the forebrain lying below the cerebrum. It consists of two parts i.e., Thalamus and Hypothalamus

Cerebellum: The cerebellum is a smaller region of the brain located at the base and under the cerebrum. Cerebellum is the centre of balance.

Medulla oblongata: This is the last part of the brain, which is connected to the spinal cord. It controls breathing and heart beat.

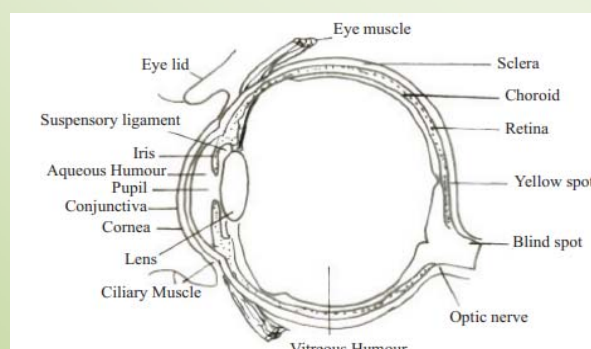
- Spinal cord is the centre for simple reflexes.
- Reflex action is an automatic, quick and involuntary action in the body brought about by a stimulus. Two types of reflexes – simple (inborn or natural) and conditioned (outcome of repeated experience)



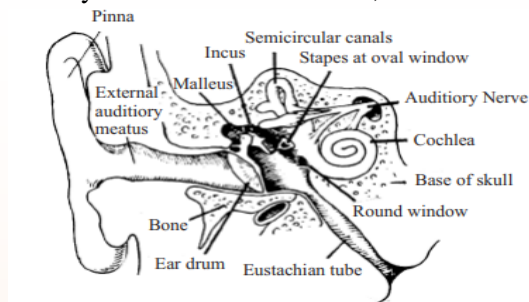
Nerve pathways in a simple reflex action

SENSORY RECEPTORS (THE SENSE ORGANS)

- The sensitive layer of the **eye** is the retina which is composed of rods (sensitive to dim light) and cones (sensitive to bright light and for colour vision).



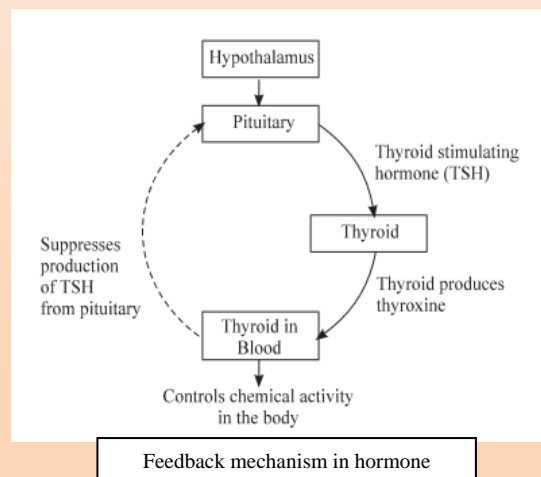
- The internal **ear** performs two tasks perception of sound by the cochlea and that of disturbance in body balance by the semicircular canals, utricle and saccule.



- The **Nose** perceives chemical stimuli by the chemicals carried by the air and the tongue by direct contact with them.
- Skin possesses receptors for touch, pain, heat cold etc.
- Chemical coordination is brought about by hormones produced by the ductless glands, that are carried by the blood and which act on the target cells or organs away from their source.
- There is a close link between the nervous and the endocrine systems, shown by the way in which the pituitary gland interacts with the hypothalamus of the brain.
- Our endocrine glands include the pituitary, thyroid, parathyroid, thymus adrenals, pancreas, gonads and placenta.
- The pituitary controls and regulates the activities of almost all other endocrine glands.
- The under secretion as well as the over secretion of the hormones, both produce ill effects.
- Hormone levels are generally controlled by feedback mechanism.

FEEDBACK MECHANISM (CONTROL OF HORMONAL SECRETION)

The amount of hormone released by an endocrine gland is determined by the body's need for the particular hormone at any given time. The product of the target tissue exerts an effect on the respective endocrine gland.



- Pheromones are secretions released outside in the environment, which produce response in other individuals of the same species.

Test Yourself

1. With the help of labelled diagram of human brain mention the function of Cerebrum and Cerebellum?
2. State the types of reflex action? Draw the diagram of Nerve pathways in a simple reflex action.
3. Mention the role of Feedback Mechanism describe with the help of example.