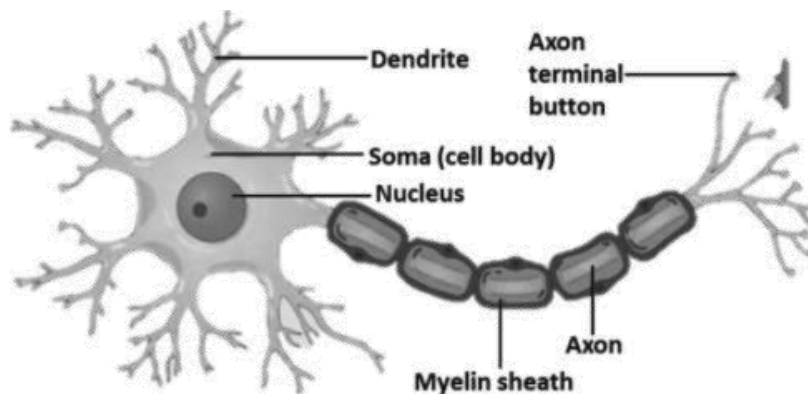


NCERT Class 10 Science Notes

Chapter 7 - Control and Coordination

● Animals- Nervous System:

- The nervous system is an organ system that controls and coordinates many body actions in animals. The brain, spinal cord, and a vast network of nerves that run throughout the body make up the nervous system.
- Sending, receiving, and processing messages in the form of chemical signals known as impulses is the responsibility of the nervous system.
- Nervous tissue is made up of a network of nerve cells or neurons that is well-organized. It is designed to transmit information from one part of the body to another via electrical impulses. The basic unit of the nervous system is the neuron.
- Each neuron is made up of three parts: the cell body, also known as the cyton, branched projections known as dendrites, and the long process leading from the cell body, known as the axon.

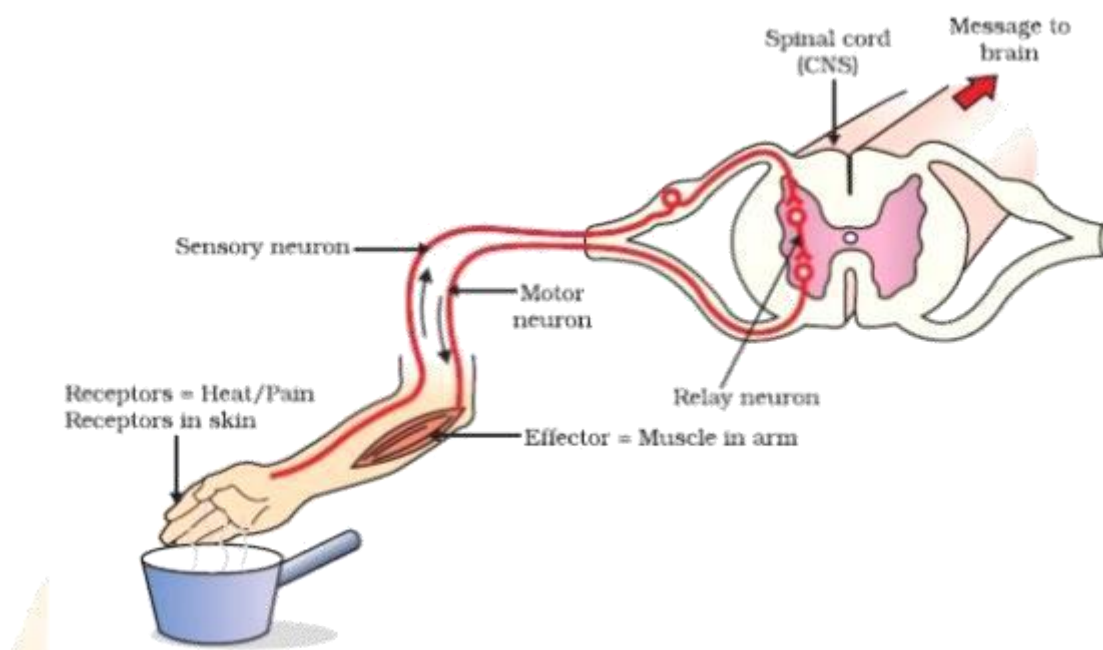


- A synapse is the connection between two neurons.
- Nerves are strands of tissue that emerge from the brain and spinal cord. Nerves are crucial for conveying messages throughout the body and branch out to all regions of the body.
- Nerve cells or neurons come in a variety of shapes and sizes.
- The brain or spinal cord receives messages from the sense organs via sensory nerves.

- Motor neurons transmit messages from the brain or spinal cord to all of the body's muscles and glands.
- Interneuron or relay neuron is a type of neuron that connects neurons in different parts of the central nervous system.

- **What happens in reflex actions?**

- A reflex action, often known as a reflex, is an automatic and practically immediate movement that occurs in reaction to a stimuli. In response to the environment, the body produces a reflex activity.
- It is possible that the process of detecting a signal or an input and responding to it with an output action can be accomplished rapidly. A reflex arc is a term used to describe such a link. Although the information input reaches the brain, reflex arcs are created in the spinal cord. The majority of sensory neurons in higher animals do not flow directly into the brain, but rather synapse in the spinal cord. For quick response, reflex arc continues to be more efficient.



- **Human brain:**

- Types of nervous system**

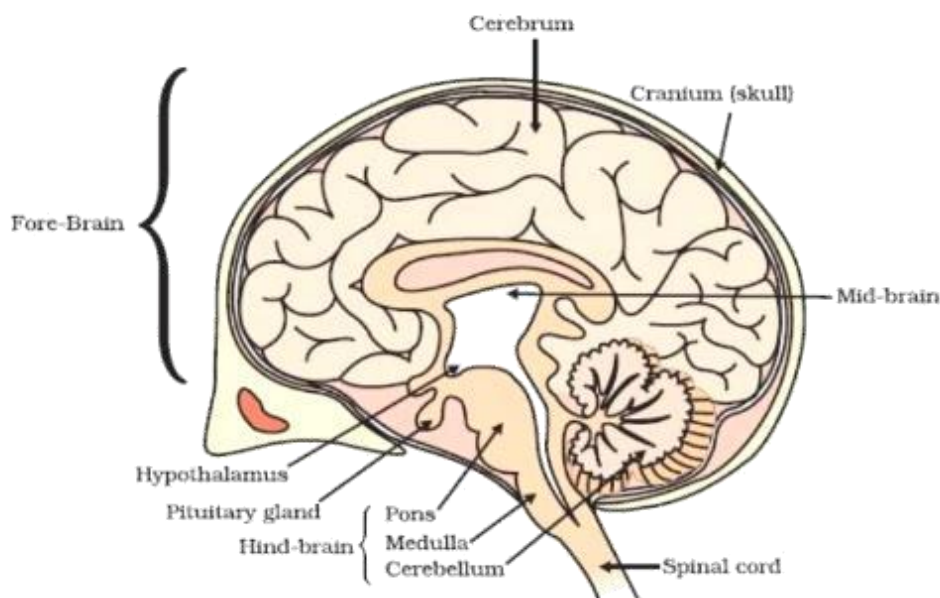
The central nervous system and the peripheral nervous system are the two parts of the nervous system.

- **Central nervous system:**

- The brain and spinal cord are part of the central nervous system. It receives data from the body and transmits instructions to certain organs. The forebrain, midbrain, and hindbrain are the three major portions or areas of the brain.
- The forebrain is the region of the brain that is responsible for thinking. The cerebrum and diencephalon make up this structure. Memory and intelligence, as well as sense centres such as hearing, smell, and sight, are all housed in the cerebrum. The diencephalon is where pressure and discomfort are stored.
- The midbrain connects the forebrain to the hindbrain and regulates vision and hearing reflexes. The cerebellum, pons, and medulla make up the hindbrain. The cerebellum is responsible for coordinating muscle actions as well as maintaining balance and posture.
- The medulla is in charge of involuntary functions such as blood pressure, salivation, vomiting, and heart rate. The spinal cord is protected by the vertebral column or backbone and extends from the medulla of the brain through the entire length of the vertebral column.

- **Peripheral nervous system:**

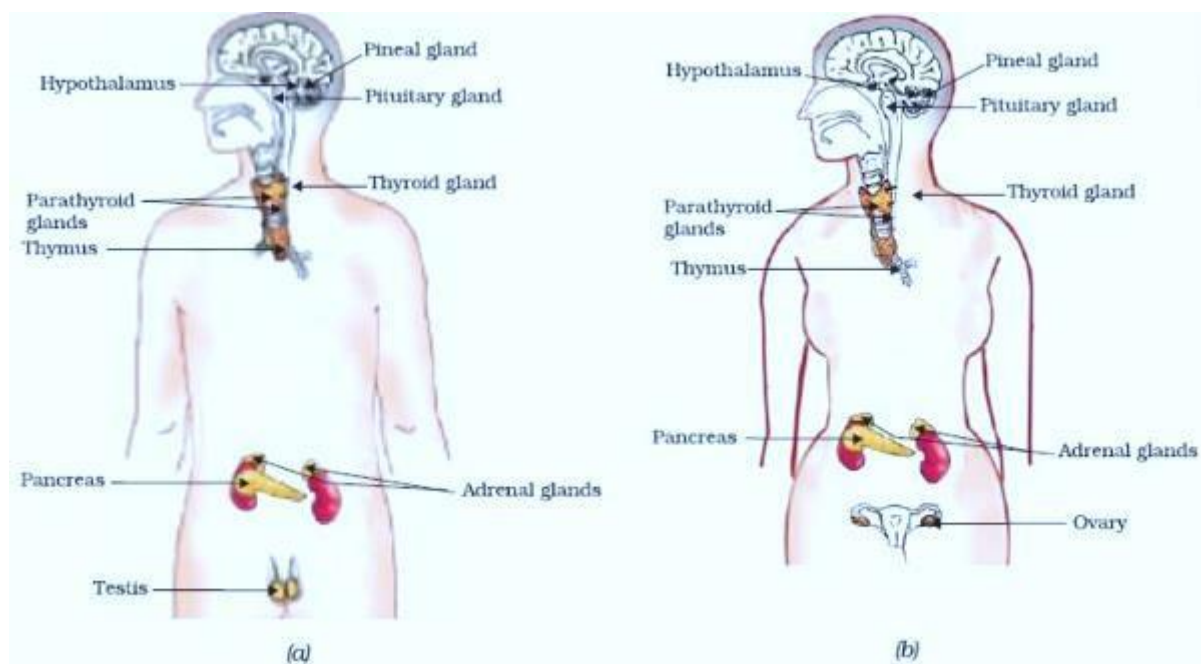
The cranial and spinal nerves emerge from the brain and spinal cord, respectively, to form the peripheral nervous system.



- **What safeguards are in place for the tissues?**
The brain is protected by the sturdy bones of the skull, as well as a fluid called cerebrospinal fluid, which absorbs additional shock.
- **What is the mechanism by which the nervous system causes action?**
Muscle fibres must move when a nerve impulse reaches them. Muscle cells will shorten as a result of their changing form. Special proteins in muscle cells change their form and arrangement in the cell in response to nerve electrical signals. When this happens, the muscle cells take on a new shape as a result of new protein groupings.
- **Plant coordination:** All living organisms react to their surroundings. Chemicals released by cells help plants respond to stimuli as well. Plants, like all living beings, move about. Plants have two types of movement: one that is dependent on growth and the other that is not. Plants also use electrical and chemical mechanisms to transmit information from cell to cell, but there is no dedicated tissue for information transmission in plants. Plants slowly respond to stimuli by growing in a specific direction. Because of the directional growth, the plant looks to be moving.
- **Directional movements:** Tropic movements are also known as directional movements. These movements can be either toward or away from the stimuli.
 - Shoots that respond to light by bending towards it are said to have positive phototropism. Shoots that grow away from the earth show **negative geotropism**.
 - **Negative phototropism** occurs when roots bend away from light. They demonstrate positive geotropism as they grow towards the ground.
 - Hydrotropism is a type of growth response in which the direction of growth is dictated by water stimuli.
 - **Chemotropism** is a plant part's growth movement in response to a chemical input.
 - **Pollen tubes** grow towards the ovules.
 - **Hormones** are chemical molecules secreted by cells that have been activated.
 - Hormones circulate throughout the cell. They are synthesised far from the point of action and then diffuse to the point of action. Different plant hormones aid in the coordination of growth, development, and environmental reactions. Auxins, gibberellins, cytokinins, and abscisic

acid are some of the hormones secreted by plants.

- **Auxins** are hormones that are produced at the stem's tip. By elongating the cells, these aid the plant's growth. Auxin promotes shoot apical dominance. Gibberellins are hormones that promote stem growth, seed germination, bolting, and blooming.
 - **Cytokinins** are hormones that are found in regions where cells divide quickly, such as fruits and seeds. They also encourage the stomata to open.
 - **Abscisic acid** is a hormone that slows growth in many regions of the body. It's also in charge of closing the stomata. Its side effects include leaf withering.
- **Animal Hormones:** The endocrine system is made up of ductless glands that emit chemical compounds known as hormones. Hormones are released directly into the bloodstream by endocrine glands.
 - Hormones are chemical messengers that are injected into the bloodstream and act on specific organs.



- **Endocrine glands**

The pituitary gland, the pineal gland, the hypothalamus, the thyroid, the parathyroid, the thymus, the adrenal gland, the pancreas, the testes, and the ovary are all examples of endocrine glands.

- **Adrenal glands:** Adrenal glands are found above the kidneys. Adrenal cortex and adrenal medulla are two parts of the adrenal gland.
 - The adrenal cortex secretes cortisol, aldosterone, and androgens, while the adrenal medulla secretes adrenaline and noradrenaline. Adrenaline is sometimes known as the "fight or flight" hormone or the "emergency hormone." It prepares the body to deal with physical stress in an emergency situation, such as danger, anger or excitement.

- **Thyroid gland:**
 - The thyroid gland is one of the largest endocrine glands in the body, and it is positioned in the neck, ventral to the larynx.
 - Triiodothyronine and thyroxine are the main hormones generated by this gland. Thyroxine is a hormone that controls the body's glucose, protein, and fat metabolism. Iodine is required for the production of thyroxine. Goiter is caused by a lack of iodine in the diet. A swollen neck is one of the signs of this condition.

- **Pituitary gland:**
 - The pituitary gland is a master gland that secretes several hormones to regulate the organs as well as the other glands. It is located near the base of the brain.
 - Growth hormone, TSH, FSH, LH, ACTH, MSH, Vasopressin, and Oxytocin are among the hormones released by this gland. Growth hormone is a hormone that controls the body's growth and development. Dwarfism is caused by a lack of this hormone throughout childhood. Gigantism is caused by excessive release of this hormone.

- **Gonads:**
Female gonads and male gonads are the two types of gonads found in humans.

- **Female gonads:**
 - Oestrogen and progesterone are two hormones produced by the ovaries.
 - Oestrogen regulates puberty-related changes such as feminine voice, soft skin, and mammary gland development; progesterone regulates uterine changes during the menstrual cycle and aids in the maintenance of pregnancy.

- **Male gonads:**
 - In males, a pair of testes constitutes the gonads.

- A pair of testes is the male sex organ placed outside the abdomen in the scrotum.
 - The hormone testosterone is produced by the testes.
 - Testosterone regulates the changes that occur throughout puberty, such as a deeper voice, the development of the penis, and the growth of facial and body hair.
- **The pancreas:**
 - The pancreas is found just below the stomach, within the duodenum's curvature. Its role is both exocrine and endocrine. Insulin, glucagon, somatostatin, and pancreatic polypeptide are among the hormones secreted by the pancreas.
 - **Insulin** is a hormone that controls the amount of sugar in our blood. Insulin secreted in little amounts raises blood sugar levels, resulting in diabetes mellitus.
- **The pineal gland:**
 - The pineal gland generates the hormone melatonin and is located towards the centre of the brain, dorsal to the diencephalon.
 - Melatonin has an impact on reproductive development, wake and sleep pattern modulation, and seasonal functions
- **The hypothalamus:**
 - The hypothalamus is a neuro-endocrine region of the brain that connects the neurological and endocrine systems via the pituitary gland, which secretes hormones like Somatostatin and Dopamine.
- **Parathyroid glands:**
 - Two pairs of small oval-shaped glands embedded on the dorsal surface of the thyroid gland in the neck are known as parathyroid glands.
 - They secrete a hormone called parathormone. It aids in calcium and phosphate ion control in the bones and blood.
 - Tetany is caused by hyposecretion, while osteoporosis is caused by hypersecretion.

- **The thymus gland:**
 - The thymus gland is located in the upper region of the sternum, in front of the heart, and generates the hormone thymosine. It also aids in the maturation of T-lymphocytes.
 - The hormone testosterone is produced by the testes.

- **Feedback systems** control the timing and number of hormones released. When blood sugar levels rise, for example, the pancreatic cells sense it and respond by creating more insulin. Insulin secretion decreases when blood sugar levels fall.