

LITTERA PUBLIC SCHOOL

SCIENCE

CHAPTER 5

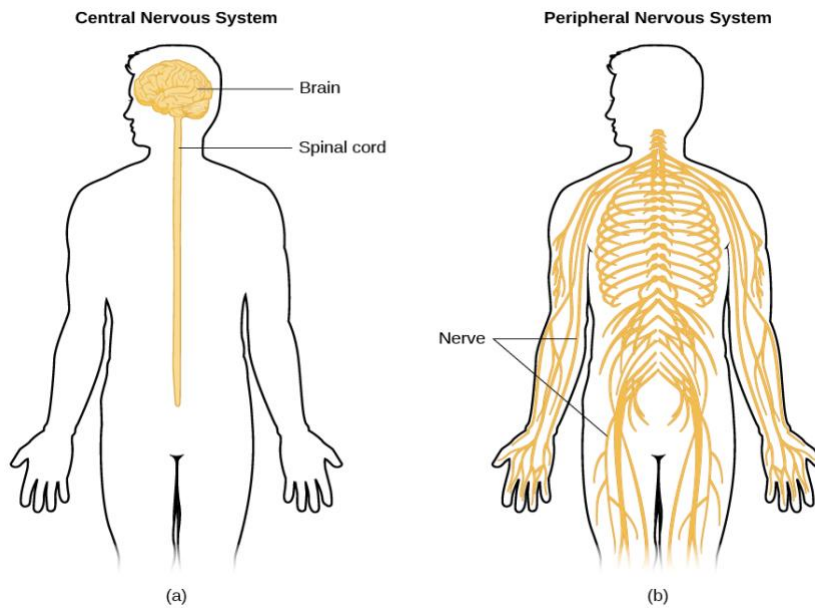
CLASS V

NERVOUS SYSTEM

The nervous system is the system which coordinates each body system within its own system and with the other systems through signal transmissions.

Parts of Nervous System

- The central nervous system includes the brain and spinal cord.
- The peripheral nervous system consists of all body nerves.



The Brain

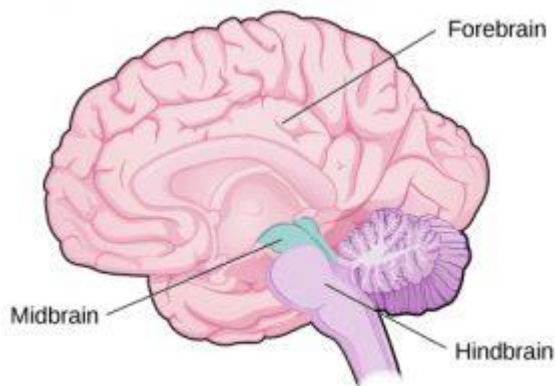
The brain is the most remarkable organ in our body.

- It is protected by the bony skull.
- It looks like a walnut and is the control centre for the whole body.
- It is like a supercomputer.
- It controls everything that goes on in your body.
- It stores a lot of information and can recall the information when needed. This is called memory. What you are reading right now is getting stored in your brain.

Structure of brain

The brain is divisible into three main regions:

- Forebrain
- Midbrain
- Hindbrain



Functions of brain

The brain is a complex organ that **controls thought, memory, emotion, touch, motor skills, vision, breathing, temperature, hunger and every process that regulates our body**. Together, the brain and spinal cord that extends from it make up the central nervous system, or CNS.

Cerebrum:

- It is the largest and uppermost part of the brain occupying about 80% of the brain.
- The cerebrum consists of the cerebral hemispheres and accounts for two-thirds of the total weight of the brain.
- One hemisphere, usually the left, is functionally dominant, controlling language and speech. The other hemisphere interprets visual and spatial information.

Cerebellum:

- The cerebellum is a major structure of the hindbrain that is located near the brainstem.
- This part of the brain is responsible for coordinating voluntary movements.
- It is also responsible for a number of functions including motor skills such as balance, coordination, and posture.

- Although the cerebellum only accounts for roughly 10% of the brain's total weight, this area is thought to contain more neurons (nerve cells) than the rest of the brain combined.

The Spinal Cord

The spinal cord is a long bundle of nerves and cells that extends from the lower portion of the brain to the lower back. It remains protected by the vertebral column.

Structure of Spinal Cord

The length of the spinal cord varies from person to person. According to some estimates, females have a spinal cord of about 43 centimetres (cm), while males have a spinal cord of about 45 cm.

The spinal cord comprises three parts: the cervical (neck), thoracic (chest), and lumbar (lower back) regions.

The Nerves

A nerve is a cable-like structure within the body designed to conduct nerve impulses that relay information from one part of the body to another.

Neuron is the unit of the nervous system.

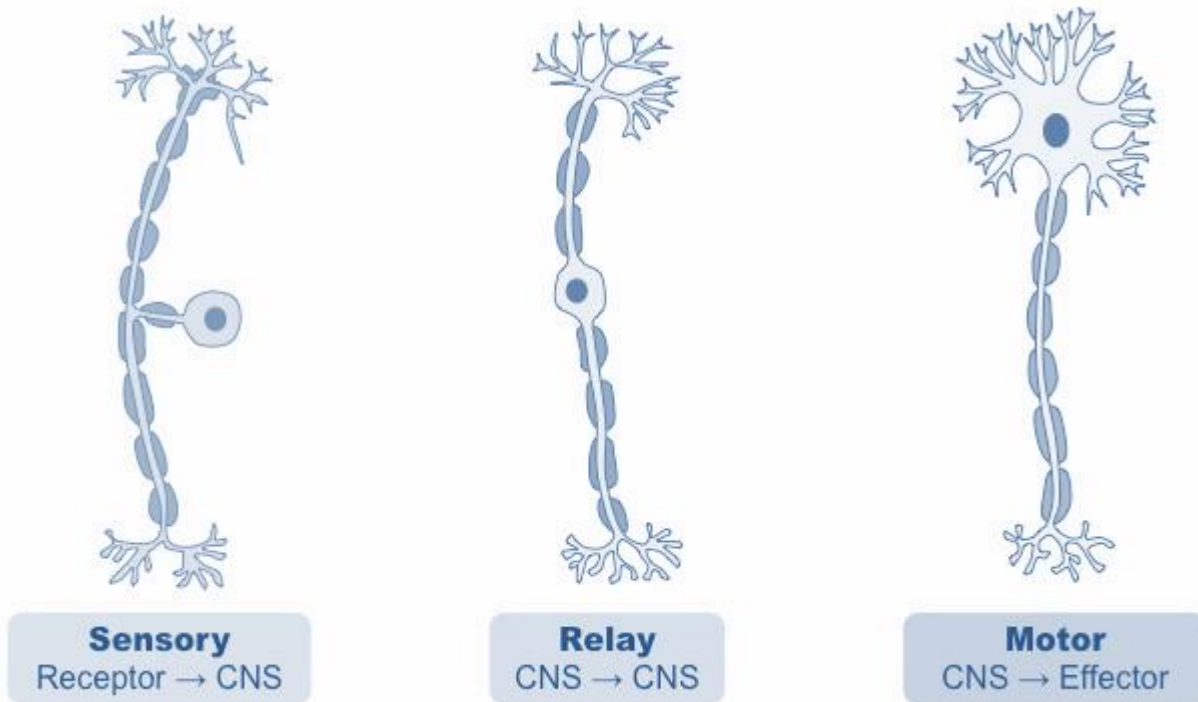
Function of nerves

- The primary function of nerves to conduct an electrochemical impulse and convey information. These impulses are carried by the individual neurons that make up the nerve.
- These impulses travel from one neuron to another by crossing a synapse. The messages are converted from electrical to chemical and then back to electrical.
- The sensory nerves carry information from the receptor to the central nervous system where the information gets processed.
- The motor nerves, on the other hand, carry information from the central nervous system to the muscles.

Types of nerves

There are three types of nerves

1. **Sensory nerves**
2. **Motor nerves**
3. **Mixed nerves.**



Sensory nerves or afferent nerves:

- These are the nerves that send messages to the brain or the spinal cord from the sense organs.
- These are enclosed in the form of a bundle like structures or nerve fibres in the peripheral nervous system.
- They carry information from the PNS to the CNS(Central Nervous System).
- The brain studies the messages and tells you what your sense organs have seen, heard, tasted, smelt or felt.

Motor nerves or efferent nerves:

- Motor nerves are those nerves that carry the messages in the form of a response from the brain or the spinal cord to other parts of the body such as the muscles and glands.
- They are responsible for carrying the information from the CNS to the PNS.
- . If your sensory nerves report that your eyes have seen a stone about to hit you, the brain will immediately send a message through the motor nerves to your leg muscles to get out of the way.

Mixed nerves or relay nerves:

- Mixed nerves are the nerves that perform both the action of sensory nerves as well as a motor nerve.

- They carry messages between the sensory nerve cells and the motor nerve cells.
- Generally, the mixed nerves transmit impulses at the rate of 120 metres per second or 432 kilometres per hour.
- They are present in the brain and spinal cord.

Reflex Actions

When you touch a hot object or when a pin pricks your finger, what is your immediate reaction? Of course, you remove your hand away from the source of pain, either the hot object or the pin. In situations like these, your reactions are always immediate, involuntary and sudden. They happen without much of a thinking process. In scientific terms, a reflex is an involuntary and rapid response to the stimulus. It is a crucial component of the famed survival instinct

The Sense Organs

Specialised organs consisting of sensory cells that respond to the external stimuli to convey impulses to the nervous system of the body are known to be **sense organs**. Sense organs play an important role in a variety of functions and help in perceiving our surroundings. These are an integral part of our bodies that enable us to sense the environment around us.

We have five primary sensory organs and the sense organs names are:

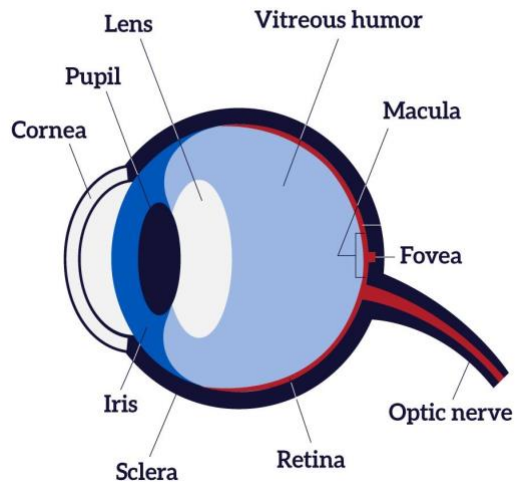
- *Ears*
- *Eyes*
- *Nose*
- *Tongue*
- *Skin*

The Eyes: the Sensory System for Vision.

Functions of Eyes :

- Eyes are the body's camera: It collects light from the visible world around us and **converts it into nerve impulses**. The optic nerve transmits these signals to the brain, which forms an image thereby providing sight.
- **Light Detection:** The human eye is only able to pick up on a small range of this light, called the visible spectrum.
- **Night Vision:** The less light there is, the less the items will reflect for the eyes, making night-time or darkness harder to see. The human eye has specialised cells called rods that allow for night vision.

Parts Of Eyes



Eyelids

An **eyelid** is a thin fold of skin that covers and protects an eye.

Iris

- It looks like a circle with an opening in the middle (pupil). Iris consist of muscles that change pupil size by constricting and relaxing.
- It is a part of the eye choroid.
- Iris is responsible for the colour of the eyes (if it is blue this means it contains few pigment cells, if brown – a lot).
- Its function is the same as aperture in a camera – to adjust light flow.

Pupil

- A small opening in the iris is known as a pupil. Its size is controlled by the help of iris.
- It controls the amount of light that enters the eye.

Lens

- Behind the pupil, there is a transparent structure called a lens. By the action of ciliary muscles, it changes its shape to focus light on the retina.
- It becomes thinner to focus distant objects and becomes thicker to focus nearby objects.

Retina

It is a light-sensitive layer that consists of numerous nerve cells. It converts images formed by the lens into electrical impulses. These electrical impulses are then transmitted to the brain through optic nerves.

The Ears :Sensory System for Hearing

Also known as the auditory sense organs, ears play an important role in hearing or perceiving sounds. After detecting sound waves or vibrations in the air, our auditory system helps us in hearing sounds. The ear is also important for our sense of balance (equilibrium) as it is known that the vestibular system, also known as the organ of balance, is found inside the inner ear.

Parts of ears

Three parts of the ear are namely-

- **Outer Ear**– It consists of the visible portion known as auricle or pinna, and a short external auditory canal (eardrum) enclosed by the tympanic membrane.

Function of Outer Ear :

The outer ear collects sound waves and makes these reach the tympanic membrane.

- **Middle Ear**– It is a narrow air-filled cavity in the temporal bone and surrounded by three tiny bones that include hammer , anvil , and stirrup.

Function of Middle Ear :

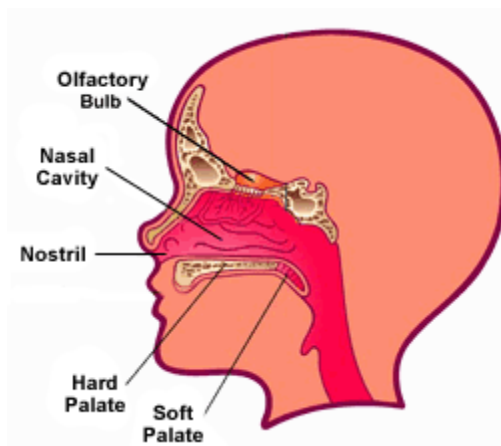
The middle ear is important because it is filled with numerous air spaces, which provide routes for infections to travel.

- **Inner Ear**– Two functional units of the inner ear are the vestibular apparatus having vestibule and semi-circular canals, and cochlea having sense organs of hearing.



The Nose : Sensory System for Smell

Known as an Olfactory organ, the nose is the primary organ of smell and functions as an important respiratory organ in the body. Besides this, it is also involved in functions such as tasting.



How it works:

We inhale air through the nose and as it passes over olfactory cells, the brain recognizes and identifies different smells. Hairs in the nose called cilia, move back and forth to take out the mucus from the sinuses and back of the nose.

Function of Nose

- [Helps in Inhalation](#)

The process of respiration starts in the nose. The oxygen enters into the nose through the nostrils and exits the same way during exhalation.

- [Purification of air:](#)

The nose warms, moistens and cleans air before it enters the lungs. It protects the airway by trapping and removing incoming dirt particles.

- [Organ of Smell](#)

The inhaled air comes in contact with the olfactory epithelium and the nerve fibres extending from the olfactory receptors accumulate the molecules containing the odour to the olfactory region of the brain and are decoded so that the smell is identified.

- **Sense of Taste**

While chewing, the food releases certain chemicals that travel up to the nose and activate the olfactory receptors inside the nose. They work in coordination with the taste buds to identify the actual flavor of the food.

The Tongue: Sensory System for Taste

The tongue is a muscular organ in the mouth covered with a moist, pink tissue called the mucosa.

- It is involved in licking, tasting, breathing, swallowing, and speaking.
- The papillae present on the tongue gives it a rough texture
- It is covered by a number of taste buds.
- There are several nerves in the tongue that help in transmitting taste signals to the brain, and thus helps in taste sensation.

Structure of Tongue

The human tongue is about 3.3 inches in men and 3.1 inches in women. It is located in the oral cavity. The tongue is divided into three parts:

- **Tip**
- **Body**
- **Base**

Function Of Tongue

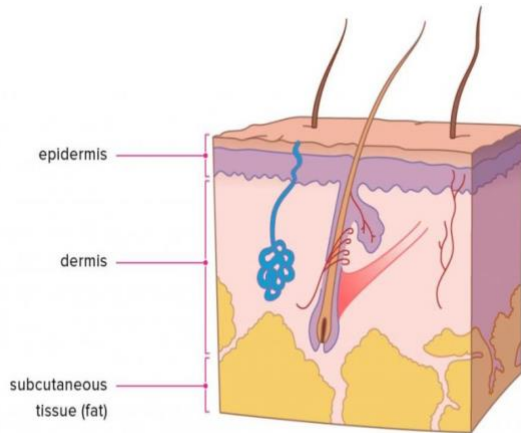
- The tongue helps in chewing.
- It helps in swallowing food.
- The tongue transmits taste signals to the brain and helps in sensing taste.
- It is an important organ that facilitates speech.
- It secretes mucous and serous fluid which keeps the mouth moist.

Taste Buds

Taste buds are sensory organs that are found on your tongue and allow you to experience tastes that are sweet, salty, sour, and bitter. The average person has about 10,000 taste buds and they're replaced every 2 weeks or so.

The Skin – Sensory System for Touch

The largest sense organ of our body is Skin and it relates to the sense of touch. It is a flexible outer covering of the body that comprises hair follicles, nerves, nails, and glands.



How it Works

It consists of sensory nerve structures or receptors that detect surface temperature, pain, physical touch, and chemical stimuli.

Functions of Skin

- Provides a protective barrier against mechanical, thermal and physical injury and hazardous substances.
- Prevents loss of moisture.
- Reduces harmful effects of UV radiation.
- Acts as a sensory organ (touch, detects temperature).
- Helps regulate temperature.
- An immune organ to detect infections etc.
- Production of vitamin D.