THE NERVOUS SYSTEM
• The nervous system consists of the brain, the spinal cord and peripheral nerves.

• Organization of nervous tissue within the body enables rapid communication between different parts of the body.
The Nervous System

Central Nervous System (CNS)
- receives and processes information
- initiates actions
  - Brain
    - receives and processes sensory information;
      initiates responses;
      stores memories;
      generates thoughts and emotions
  - Spinal Cord
    - conducts signals to and from the brain;
      controls reflex activities

Peripheral Nervous System (PNS)
- transmits signals between the CNS and the rest of the body
  - Motor Neurons
    - carry signals from the CNS that control the activities of muscles and glands
  - Sensory Neurons
    - carry signals to the CNS from sensory organs

Somatic Nervous System
- controls voluntary movements by activating skeletal muscles

Autonomic Nervous System
- controls involuntary responses by influencing organs, glands, and smooth muscle
  - Sympathetic Division
    - prepares the body for stressful or energetic activity; "fight or flight"
  - Parasympathetic Division
    - dominates during times of "rest and rumination";
      directs maintenance activities
• Neurons are actively involved in conducting nerve impulses.
• The strength of the impulse is maintained throughout the length of the neuron.
• Some neurons initiate nerve impulses while others act as relay stations where impulses are passed on and sometimes redirected.
• The axon (nerve fibre) is a single long process that extends from the cell body.
• Axons are found deep in the brain and in groups called, *tracts*, at the periphery of the spinal cord.
• The portion of the axon closest to the cell body plus the part of the cell body where axon is joined is known as the *initial segment or trigger zone*.
• The initial segment is where in most neurons, the electric signals are generated that then propagate away from the cell body along the axon.
Sensory receptors

- Specialized endings of sensory neurones respond to different stimuli inside and outside the body.

- **Somatic, cutaneous or common senses.**

- These originate in the skin.
- They are pain, touch, heat and cold.
- Sensory nerve endings in the skin are fine branching filaments without myelin sheath.
Special senses

• These are sight, hearing, smell, touch and taste.

Autonomic afferent nerves

• These originate in internal organs, glands and tissues, e.g. baroreceptors, chemoreceptors, and are associated with reflex regulation of involuntary activity and visceral pain.
Their action is short lived as immediately they have stimulated the post synaptic neuron or effector organ, such as a muscle fiber, they are either inactivated by enzymes or taken back into the synaptic knob.
The endings of autonomic nerves supplying smooth muscle and glands branch near their effector structure and release a neurotransmitter which stimulates or depresses the activity of the structure.
CENTRAL NERVOUS SYSTEM

• The central nervous system consists of the brain and the spinal cord.
Functions of the cerebrum

• There are 3 main varieties of activities associated with the cerebral cortex;

✓ Mental activities involved in memory, intelligence, sense of responsibility, thinking, reasoning, moral sense and learning are attributed to the *higher centres*. 
The frontal area. This extends Anteriorly from the premotor area to include the remainder of the frontal lobe.

- It is a large area and it is more highly developed in humans than in other animals.
The taste area. This is thought to lie just above the lateral sulcus in the deep layers of the sensory area.

- This is the area where impulses from special nerve endings in taste buds in the tongue and in the lining of the cheeks, palate and pharynx are perceived as taste.
Hypothalamus

• The hypothalamus is composed of a number of groups of nerve cells.
• It is situated below and in front of the thalamus, immediately above the pituitary gland.
• The hypothalamus is linked to the posterior lobe of the pituitary gland by nerve fibers and to the anterior lobe by a complex system of blood vessels.
✓ Body temperature
✓ Emotional reactions, e.g. pleasure, fear, rage.
✓ Sexual behavior including mating and child rearing.
✓ Biological clocks or circadian rhythms, e.g. sleeping and waking cycles, body temperature and secretion of some hormones.
• Except for the cranial nerves, the spinal cord is the nervous tissue link between the brain and the rest of the body.

• Nerves conveying impulses from the brain to various organs and tissues descend through the spinal cord.
• At appropriate level they leave the cord and pass to the structure they supply.

• Similarly, sensory nerves from organs and tissues enter and pass upwards in the spinal cord to the brain.
These nerve impulses have 2 destinations:
- By a three-neurone system, the impulses reach the sensory area of the opposite hemisphere of the cerebrum.
- By 2 neurone system, the nerve impulses reach the cerebellar hemisphere on the same side.
• A reflex action is an immediate motor response to a sensory stimulus.
• Many connector and motor neurones may be stimulated by afferent impulses from a small area of skin, e.g. the pain impulses initiated by touching a very hot surface with the finger are transmitted to the spinal cord by sensory nerves.
• By tapping the tendon just below the knee when it is bent, the sensory nerve endings in the tendon and in the thigh muscles are stretched.

• This initiates a nerve impulse which passes into the spinal cord to the cell body of the lower motor neurone in the anterior column of grey matter on the same side.