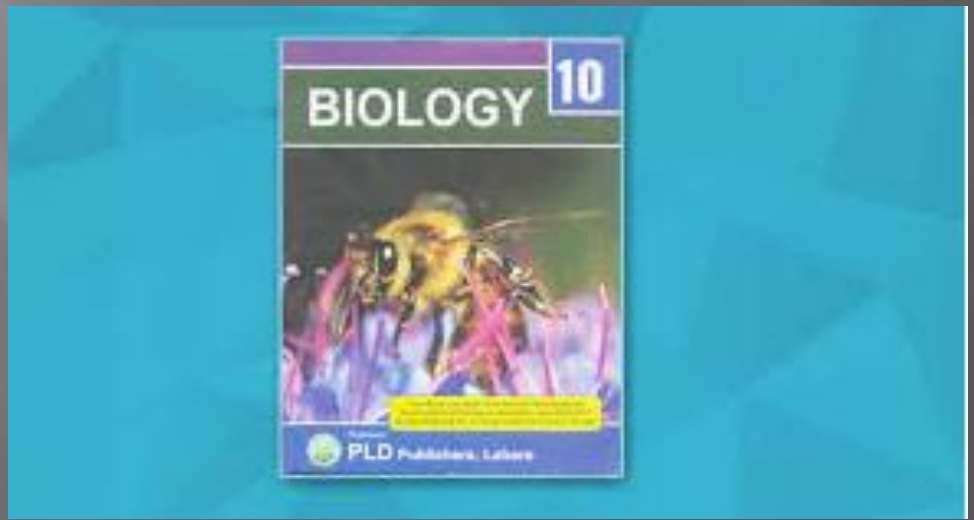
Pakistan School
Kingdom of Bahrain

BIOLOGY LESSON 10TH



Ch.3. COORDINATION & CONTROL

- TOPIC. **HUMAN NERVOUS SYSTEM**
- SUB.TOPICS. **CNS & PNS**

OBJECTIVES OF THE LESSON

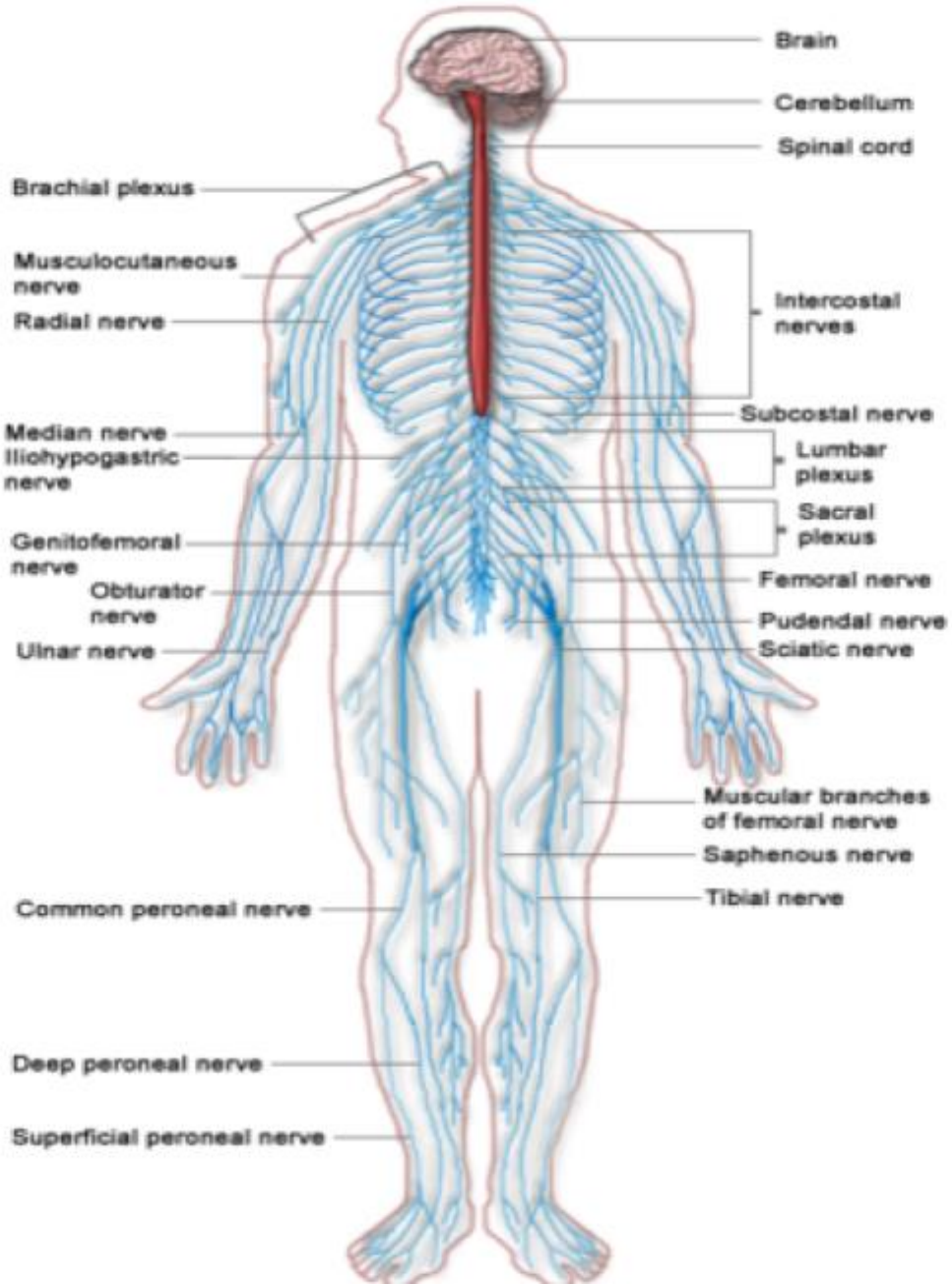
- At the end of this lesson students will be able to

- **State the structure & function of spinal cord**.

- **Describe the PNS**.

- **Recognize the path of Reflex arc in a Reflex action.**

HUMAN NERVOUS SYSTEM



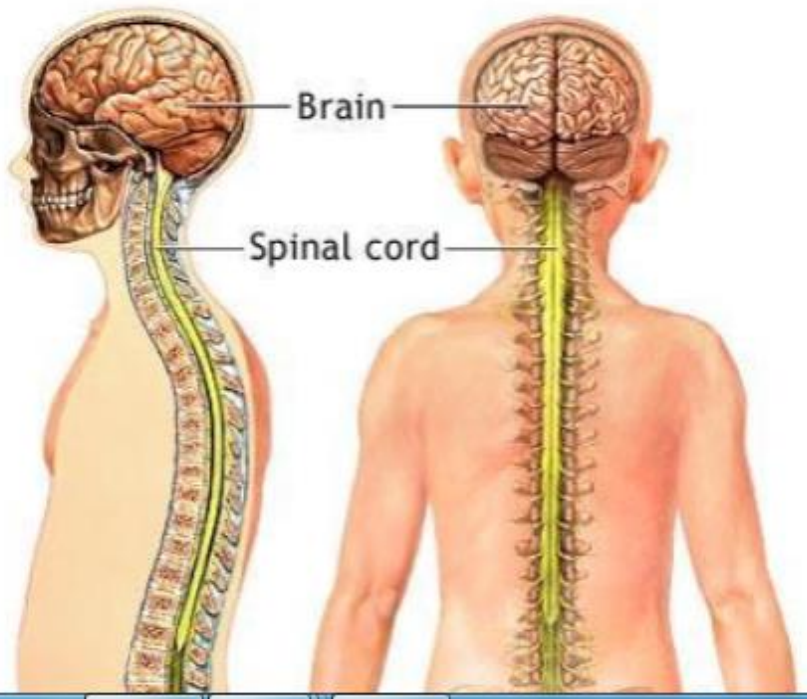
3) Human nervous system :-

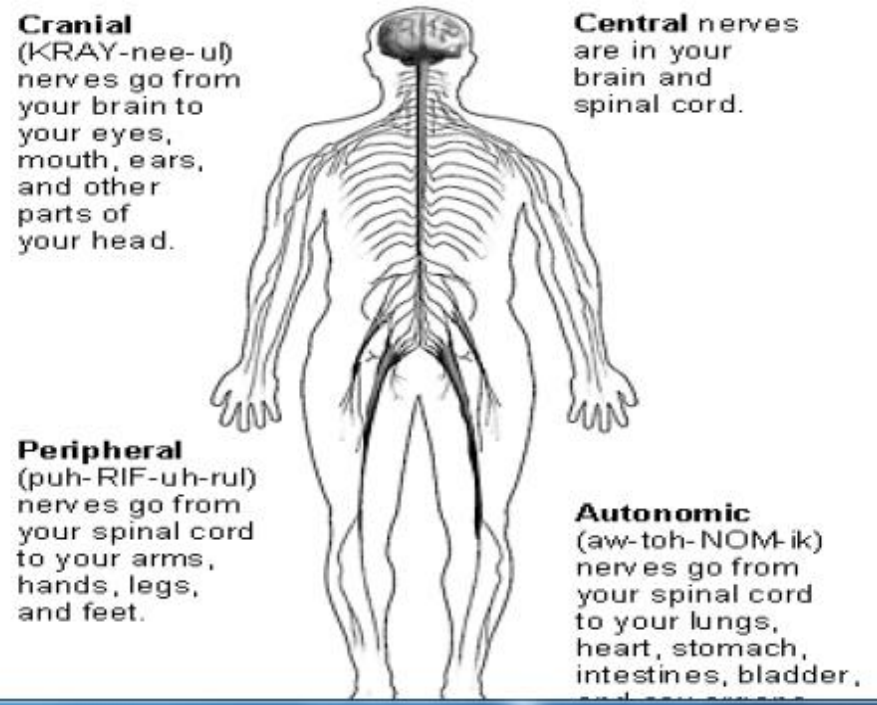
a) Parts of the nervous system :-

The human nervous system consists of the Central Nervous System and Peripheral Nervous System.

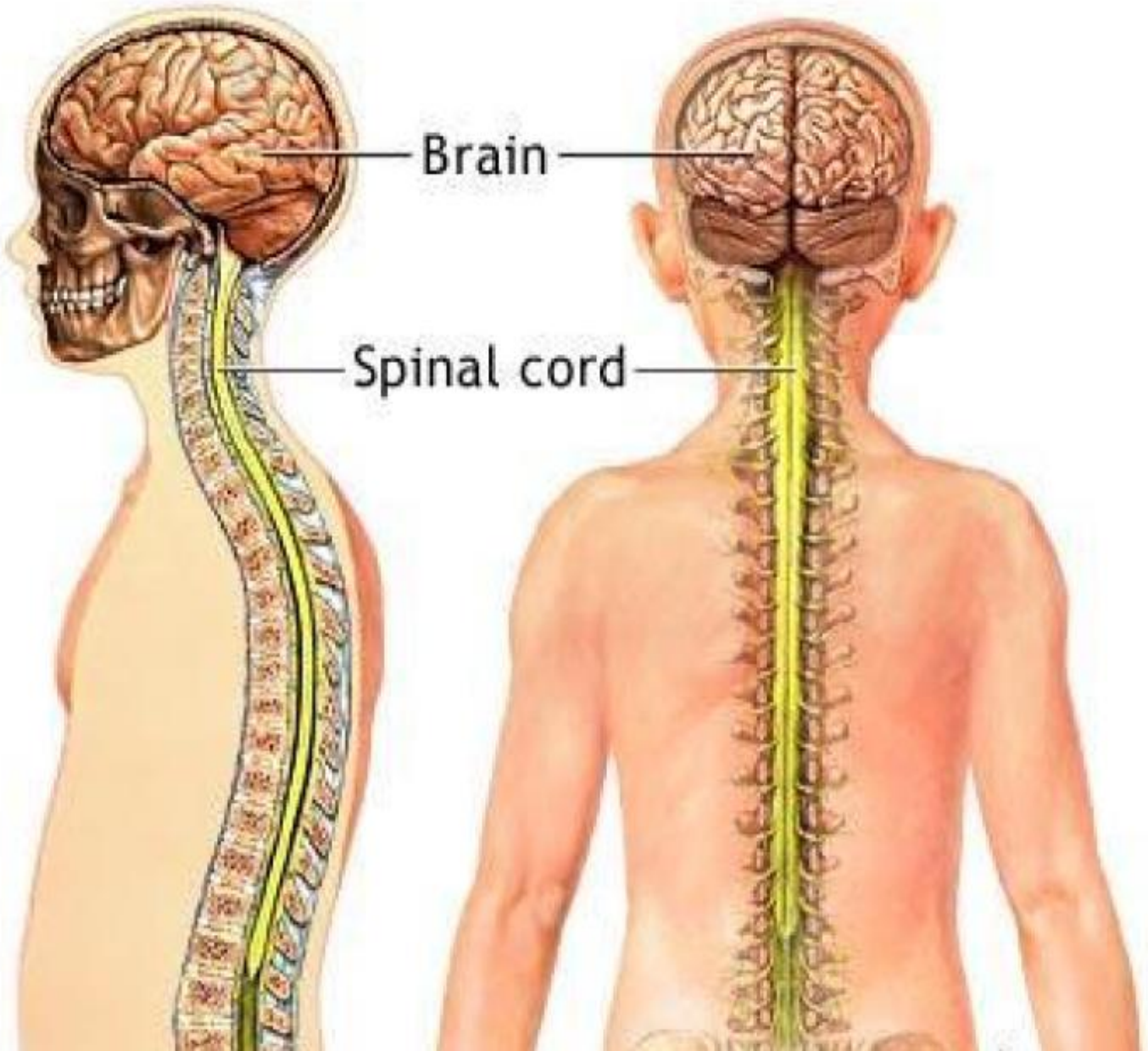
i) The central nervous system :- consists of the brain, and spinal cord.

ii) The peripheral nervous system:- consists of cranial nerves arising from the brain and spinal nerves arising from the spinal cord.



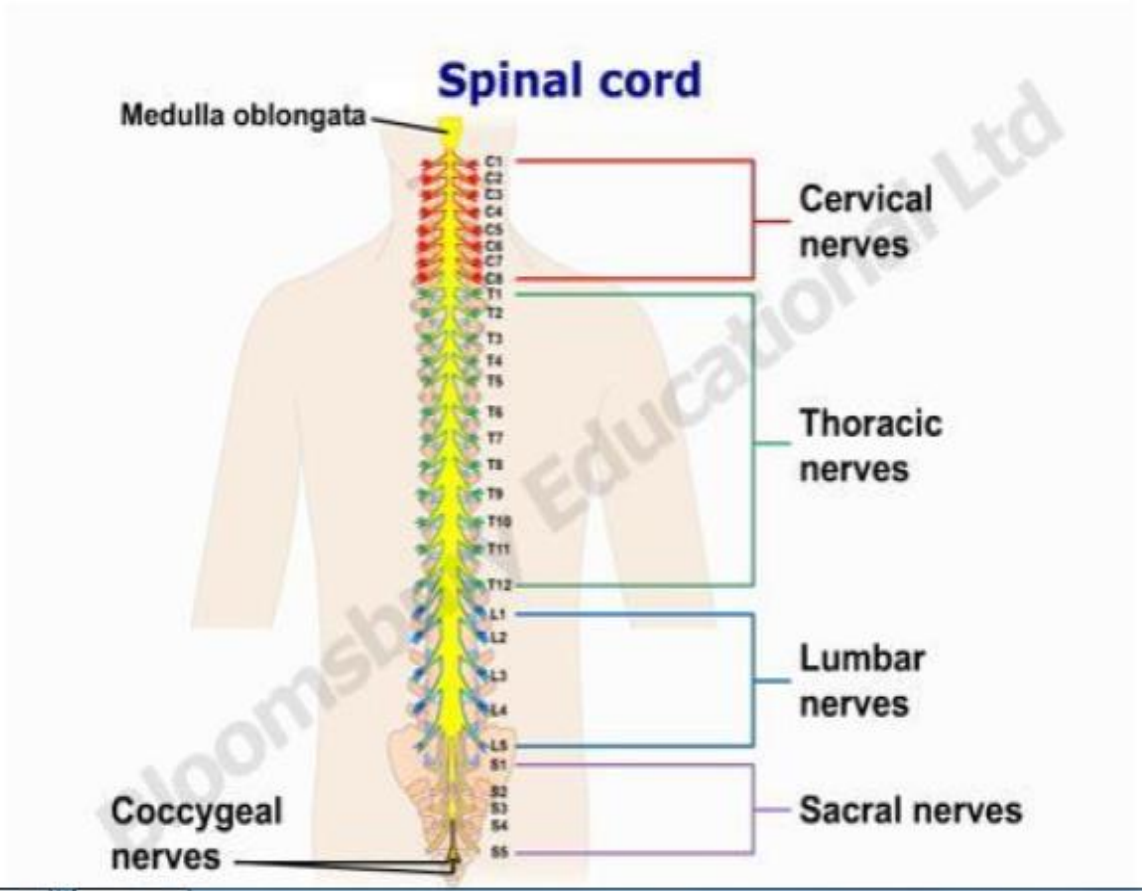


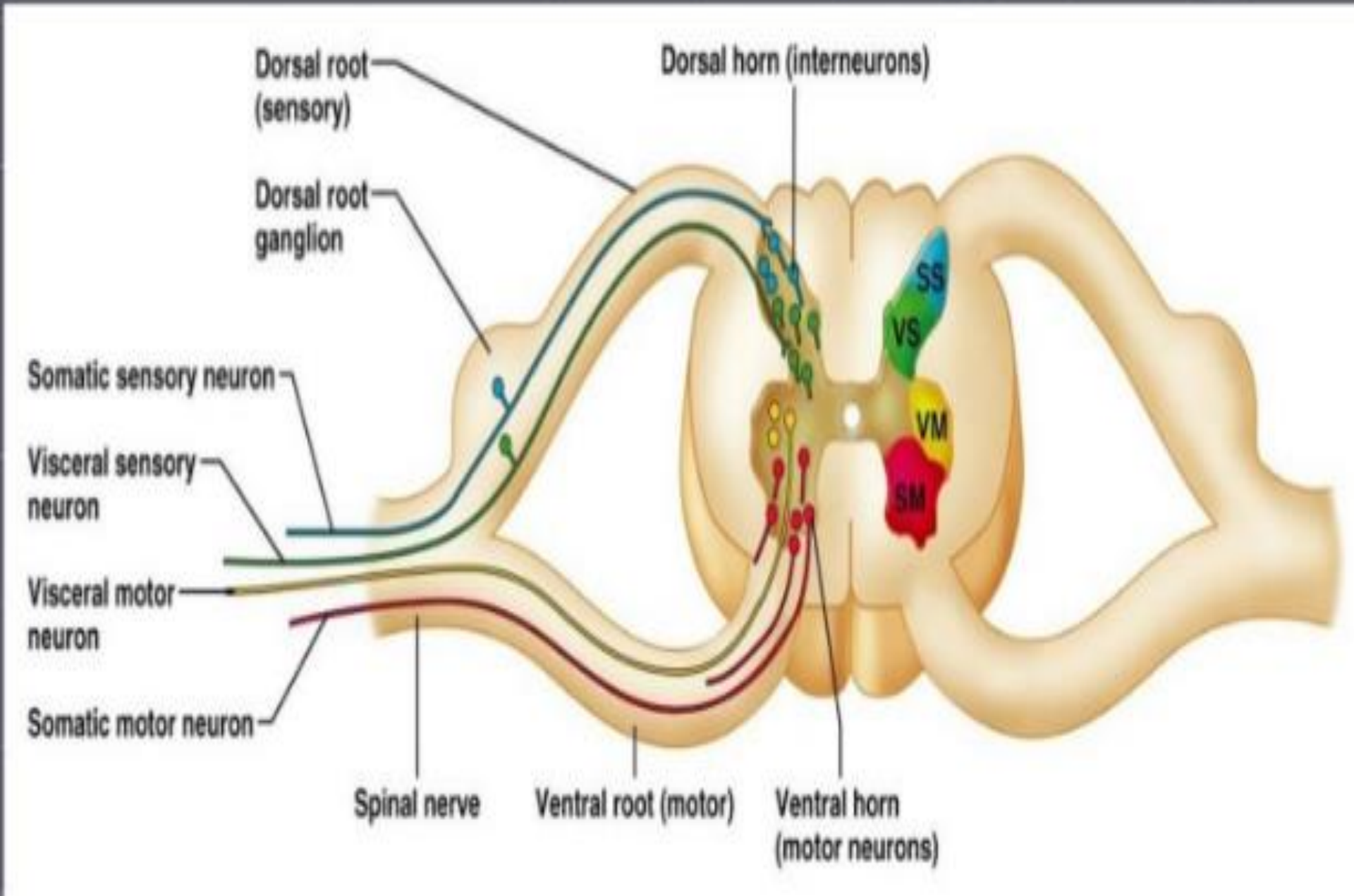
CENTRAL NERVOUS SYSTEM



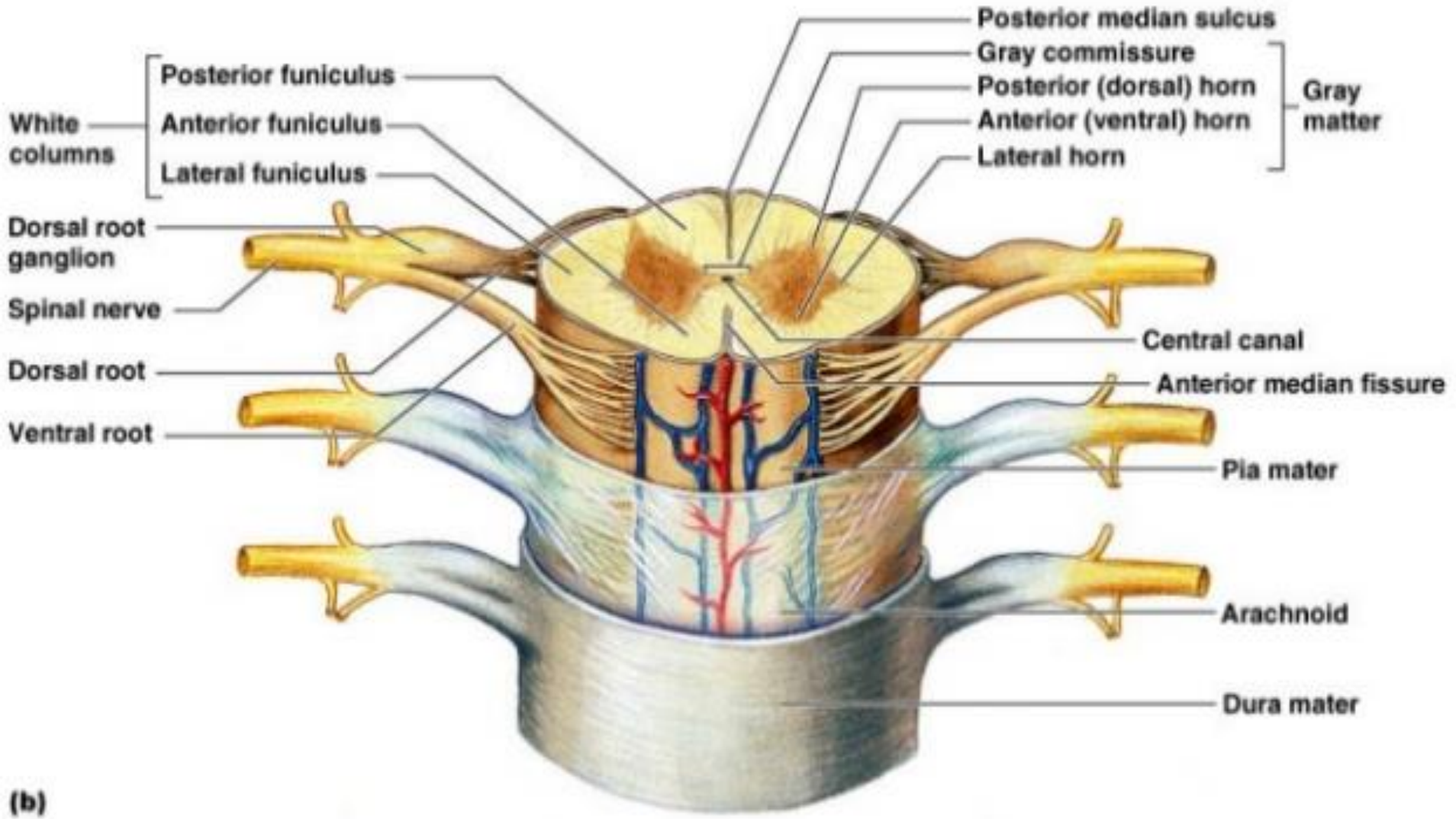
d) Spinal cord :-

The spinal cord starts from the brain and extends through the vertebral column. It has 31 pairs of spinal nerves.
It carries messages to and from the brain. It also controls reflex actions.




Dorsal root (sensory)
Dorsal root ganglion
Dorsal horn (interneurons)
SS
VS
VM
SM
Somatic sensory neuron
Visceral sensory neuron
Visceral motor neuron
Somatic motor neuron
Spinal nerve
Ventral root (motor)
Ventral horn (motor neurons)

Meninges in Spinal Cord



Spinal Cord

- Extends from the medulla oblongata of the brain to the area around the first lumbar vertebra in the lower back
- Nerves from the peripheral nervous system extend out from the spinal cord.
- Protected by:
  - Vertebral column
  - Cerebrospinal fluid
  - Meninges
- Meninges are three layers of membranes that cover the brain and spinal cord.

Layers of the meninges

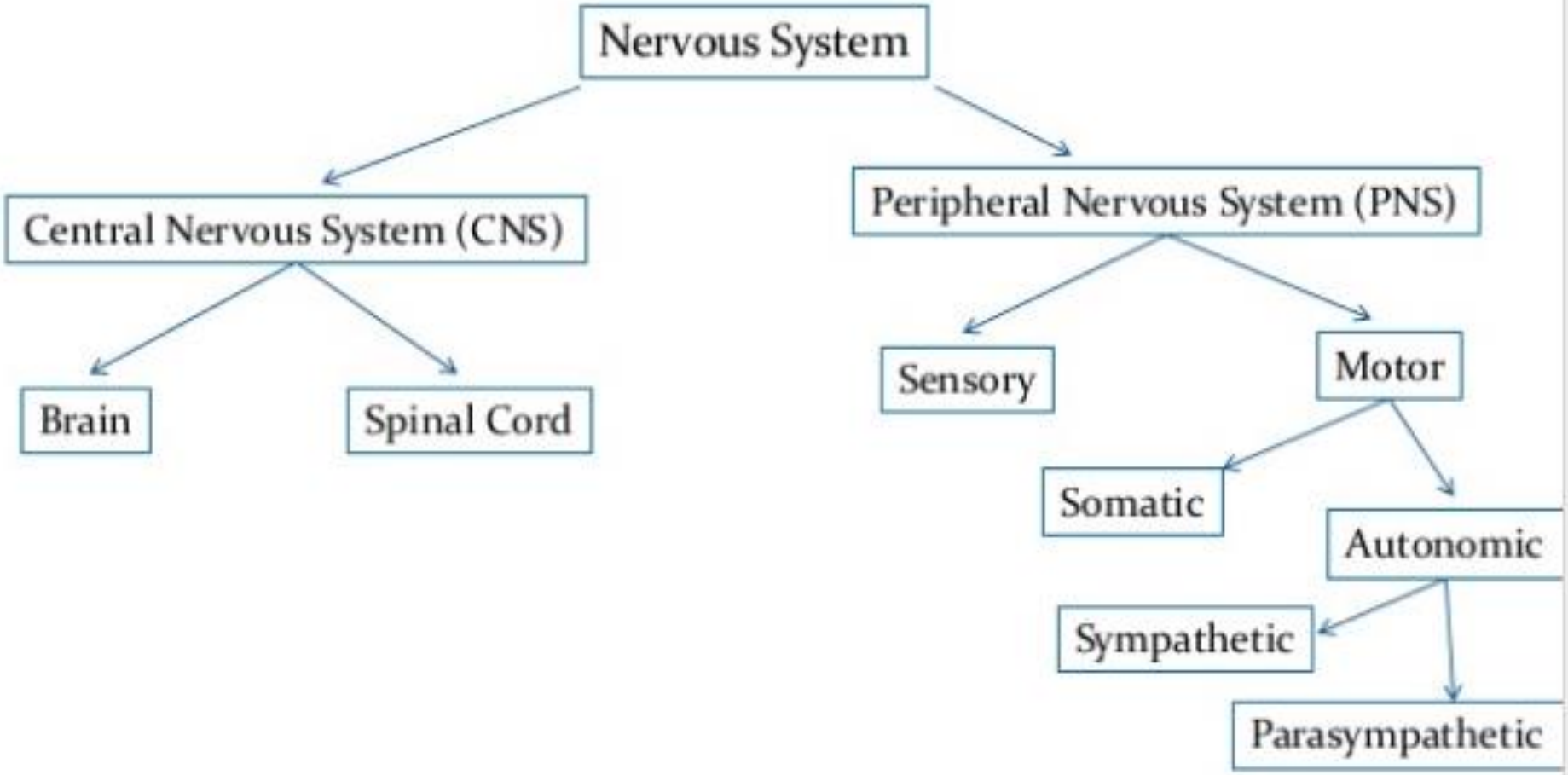
- Dura mater
  - Outer tough fibrous membrane.
- Arachnoid mater
  - Middle weblike membrane containing CSF.
- Pia mater
  - Innermost layer containing several blood vessels.

Functions of the Spinal Cord

1. Conduction
   - bundles of fibers passing information up and down spinal cord
1. Locomotion
   - repetitive, coordinated actions of several muscle groups
   - central pattern generators- are pools of neurons providing control of flexors and extensors (walking)
1. Reflexes
   - involuntary, stereotyped responses to stimuli (remove hand from hot stove)
   - involves brain, spinal cord and peripheral nerves

The Peripheral Nervous System

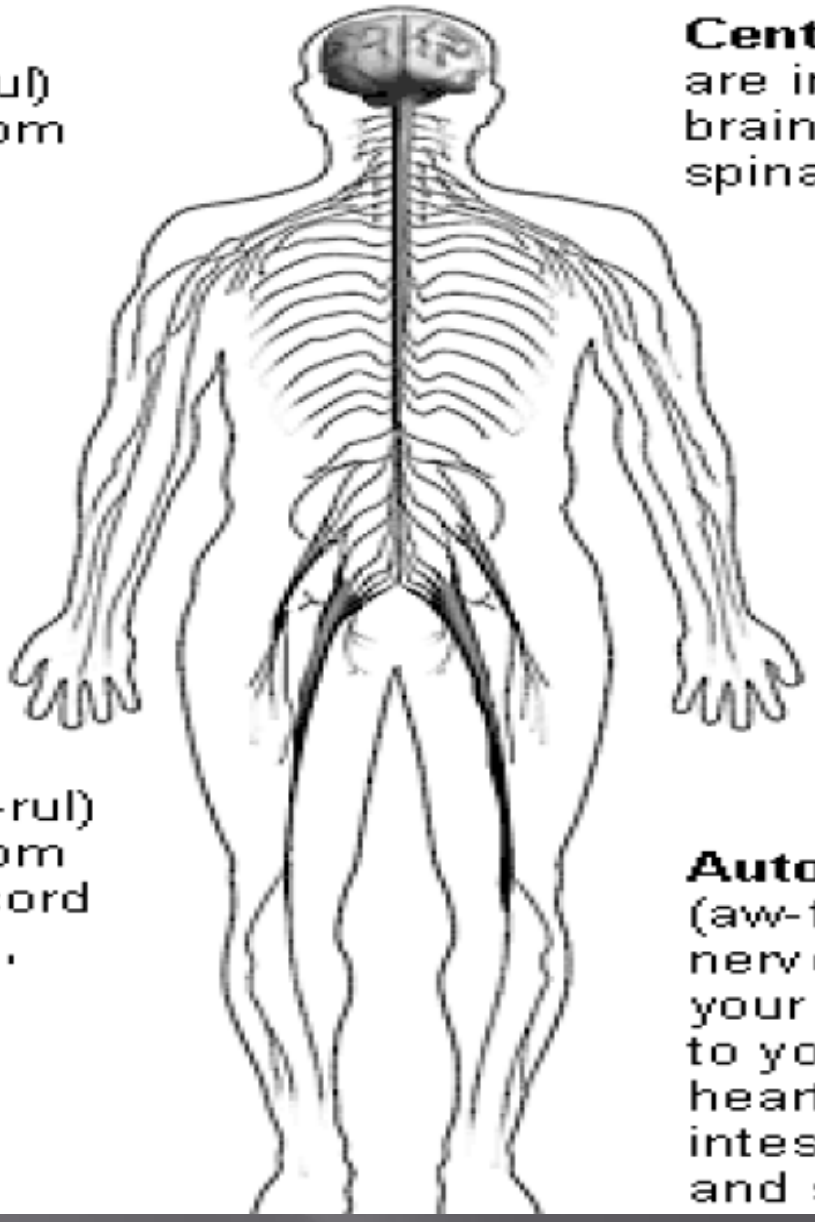
Organization of the Nervous System



PERIPHERAL NERVOUS SYSTEM

Cranial (KRAY-nee-uł) nerves go from your brain to your eyes, mouth, ears, and other parts of your head.

Central nerves are in your brain and spinal cord.



Peripheral (puh-RIF-uh-rul) nerves go from your spinal cord to your arms, hands, legs, and feet.

Autonomic (aw-toh-NOM-ik) nerves go from your spinal cord to your lungs, heart, stomach, intestines, bladder, and sex organs.

- The peripheral nervous system is the channel for the relay of sensory and motor impulses between the central nervous system on one hand and the body surface, skeletal muscles, and internal organs on the other hand.

- Neurons which carry information from the body to the CNS are called sensory neurons whereas neurons which carry information from the CNS to the rest of the body are called motor neurons.

- The cell bodies of peripheral neurons are often found grouped into clusters called ganglia.

- The somatic nervous system is composed of spinal nerves and cranial nerves. The cranial nerves are the ones that exit from the brain and the spinal nerves are the ones that exit from the spinal cord.

- The somatic nervous system controls skeletal muscles as well as external sensory organs such as the skin. This system is said to be voluntary.

- The autonomic system is the part of the PNS responsible for regulating involuntary body functions such as blood flow, heartbeat, digestion and breathing.

- Involuntary actions are controlled by antagonistic actions of the two divisions of the autonomic nervous system – the sympathetic and the parasympathetic divisions.

- Stimulation from sympathetic nerves dilates the pupils, accelerates the heartbeat, increases the breathing rate and inhibits the digestive tract.

- The parasympathetic system returns the body functions to normal after they have been altered by sympathetic stimulation.

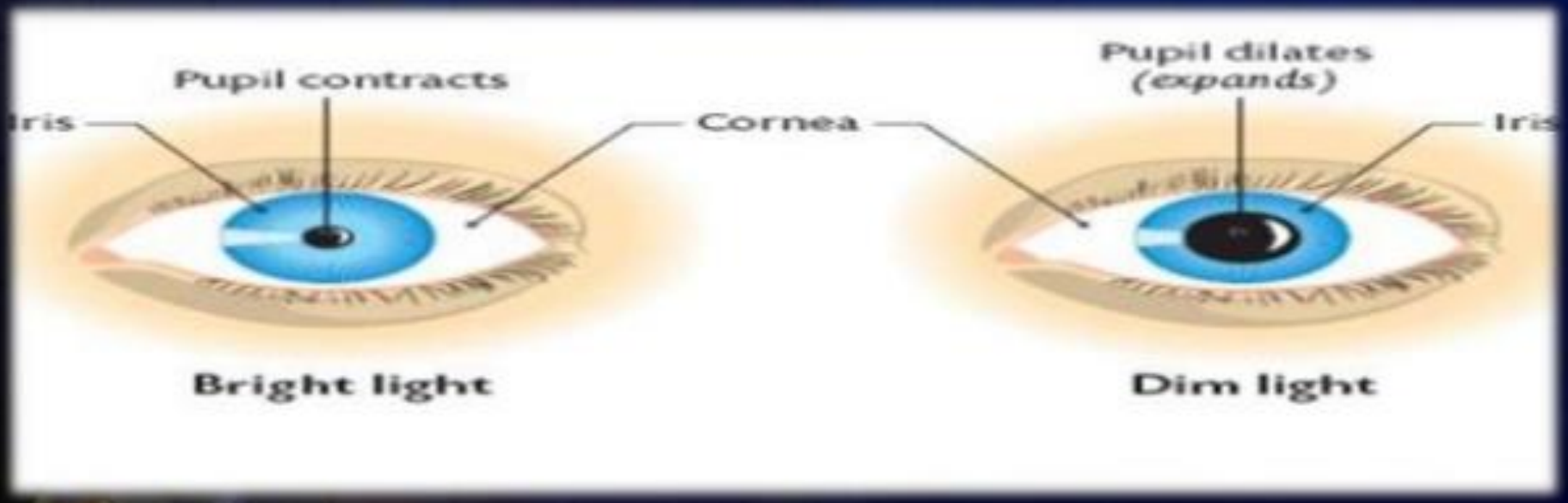

Reflex Action
and
Reflex Arc

Reflex Action

- **Reflex Action-**This is a rapid, automatic response to a stimulus which is not under voluntary control of the brain. The stimulus produces the same response every time
- Sneezing and Blinking are two examples of Reflexes.

Reflex Action contd..

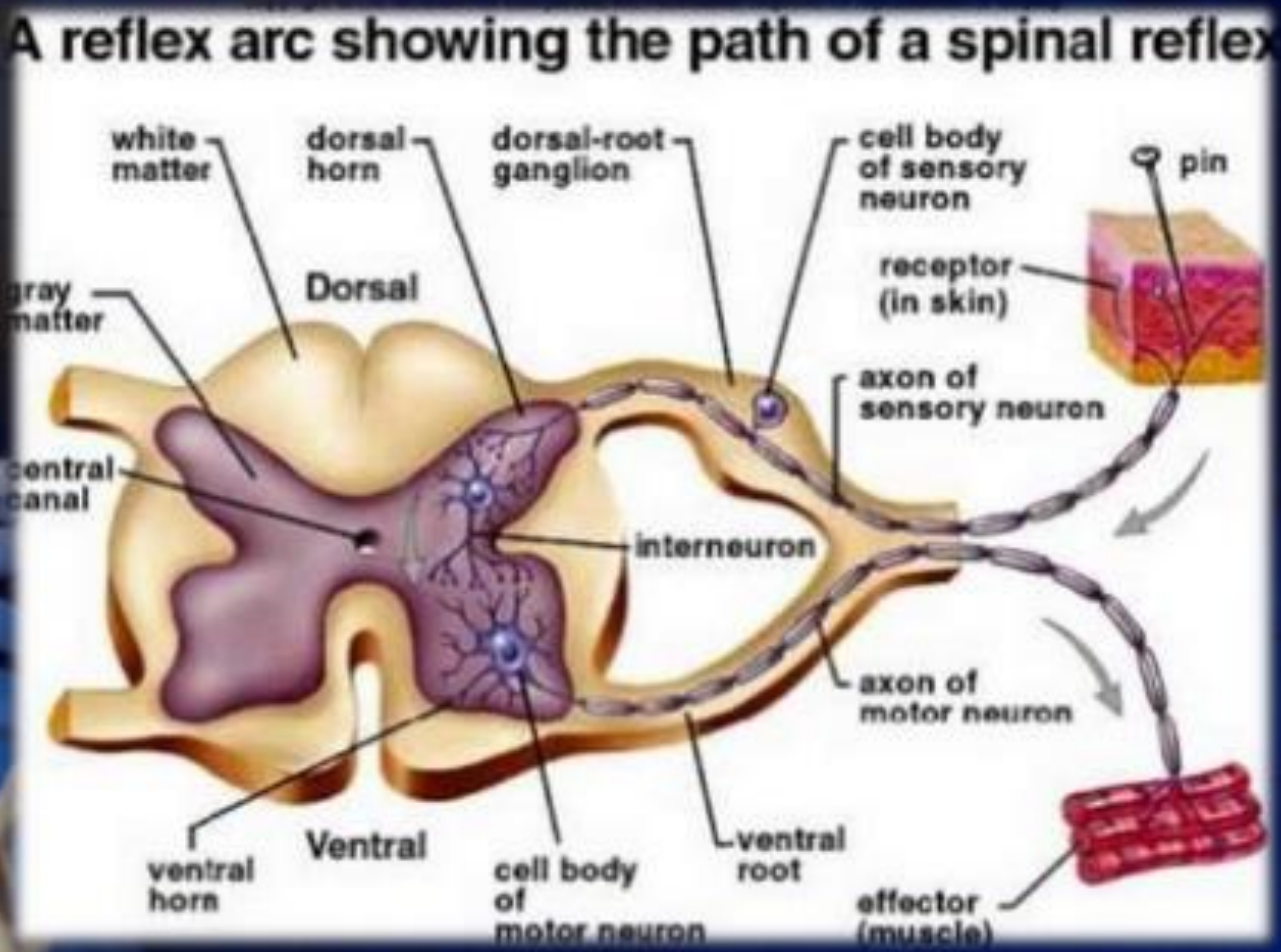
- REFLEXES are very fast, and Most Reflexes Never Reach the Brain.
- Sensory Neurons carry impulses from RECEPTORS to the spinal cord.
- Motor Neurons carry impulses from the spinal cord to the EFFECTORS.
- Within the spinal cord, motor and sensory neurons are connected by INTERNEURONS.


Pupil contracts
Iris
Cornea
Bright light
Pupil dilates
(expands)
Iris
Dim light


MOTOR NEURONE
TELLS MUSCLE TO
CONTRACT
3.
IMPACT
1.
2.
STRETCH
RECEPTOR
STIMULATED -
MESSAGE TO
SPINAL CORD
4.
LEG
KICKS
UP
REFLEX

Reflex Arc

- Reflex Arc- The pathway (or route)taken by nerve impulses in a reflex action

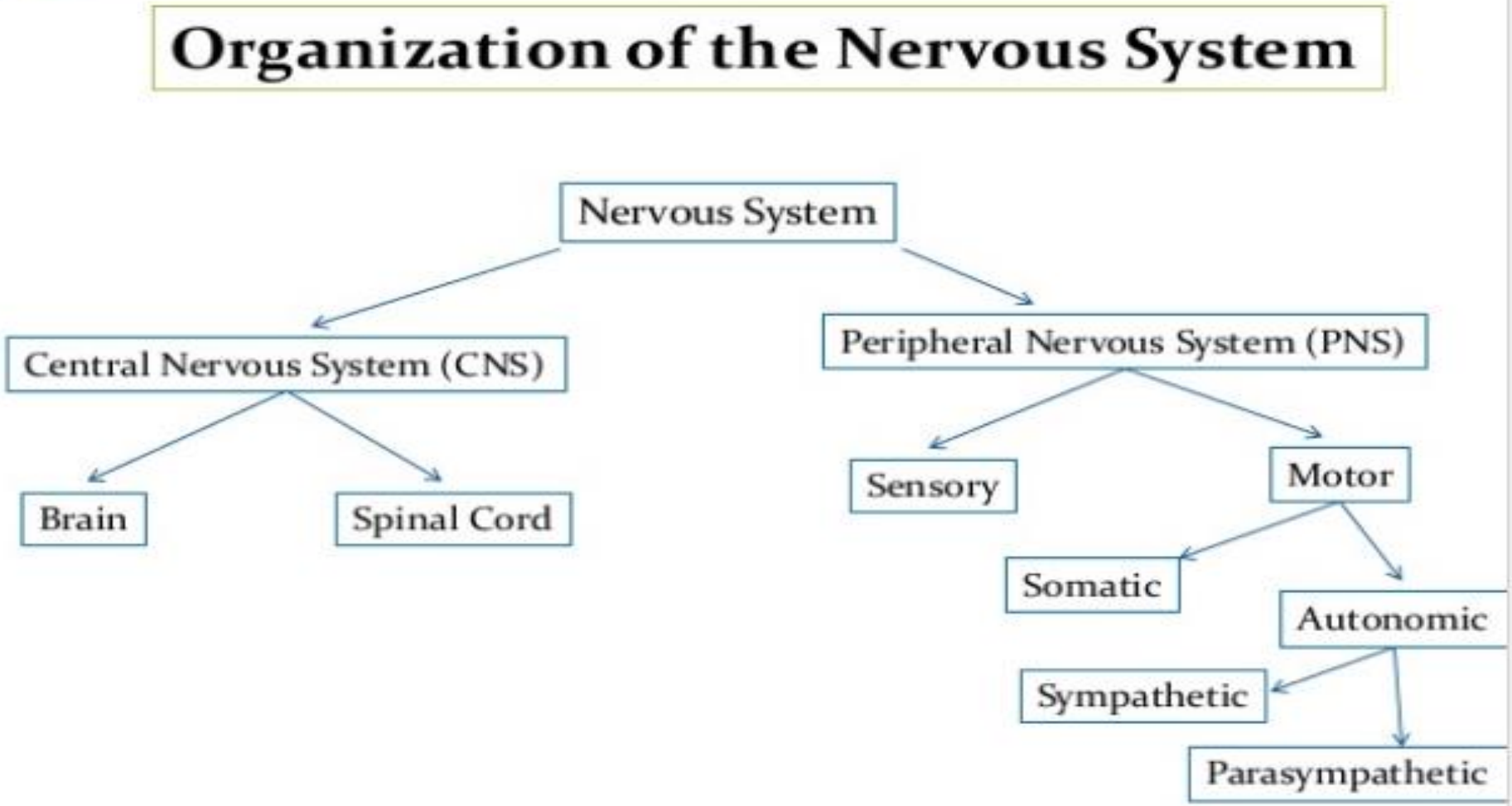


ACTIVITY

- Answer the following questions.

i. What do you mean by PNS & CNS?
ii. Differentiate between voluntary and involuntary actions.
iii. Give some examples of voluntary and involuntary actions
iv. Define autonomic nervous system.
v. Differentiate between Reflex action and Reflex arc.

CLOSURE


Organization of the Nervous System
Nervous System
Central Nervous System (CNS)
Peripheral Nervous System (PNS)
Brain
Spinal Cord
Sensory
Motor
Somatic
Autonomic
Sympathetic
Parasympathetic

HOME WORK

- Describe the process of Reflex arc and Reflex action with the help of examples in our daily life.

- Explain the structure of a spinal cord with the help of labeled diagram.

THE END!!!

- Thank you for your cooperation and attention!!
- Hope you learned some new, exciting things.