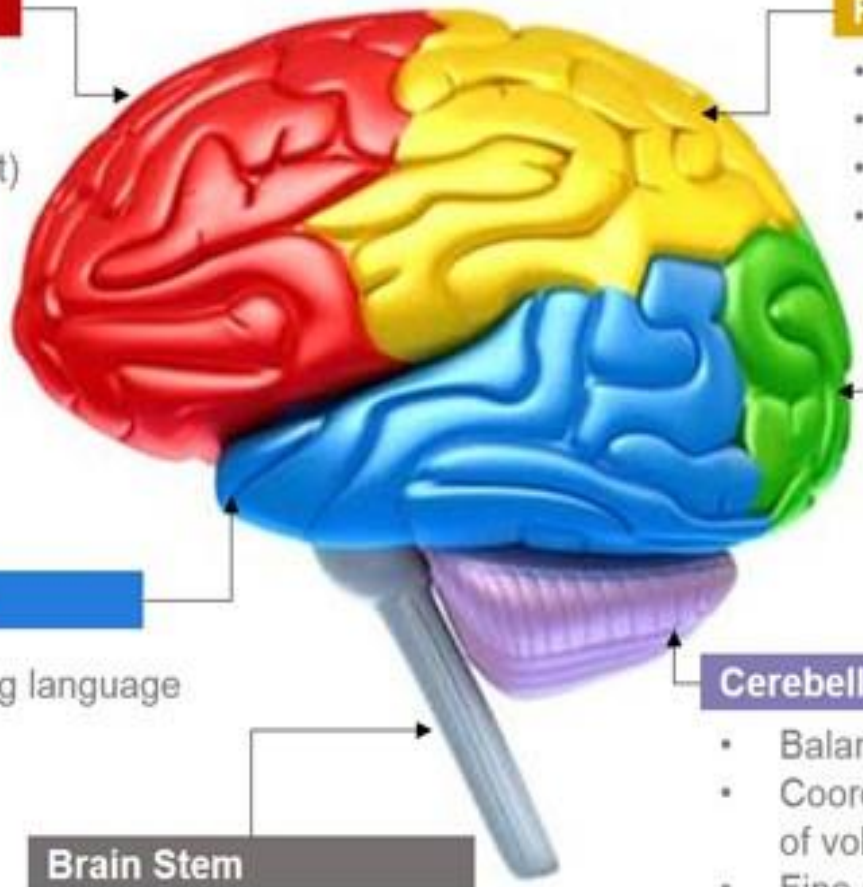

بسم الله الرحمن الرحيم


لا إله إلا الله محمد رسول الله



Frontal Lobe

- Problem solving
- Emotional traits
- Reasoning (judgment)
- Speaking
- Voluntary motor activity

Parietal Lobe

- Knowing right from left
- Sensation
- Reading
- Body orientation

Occipital Lobe

- Vision
- Color perception

Temporal Lobe

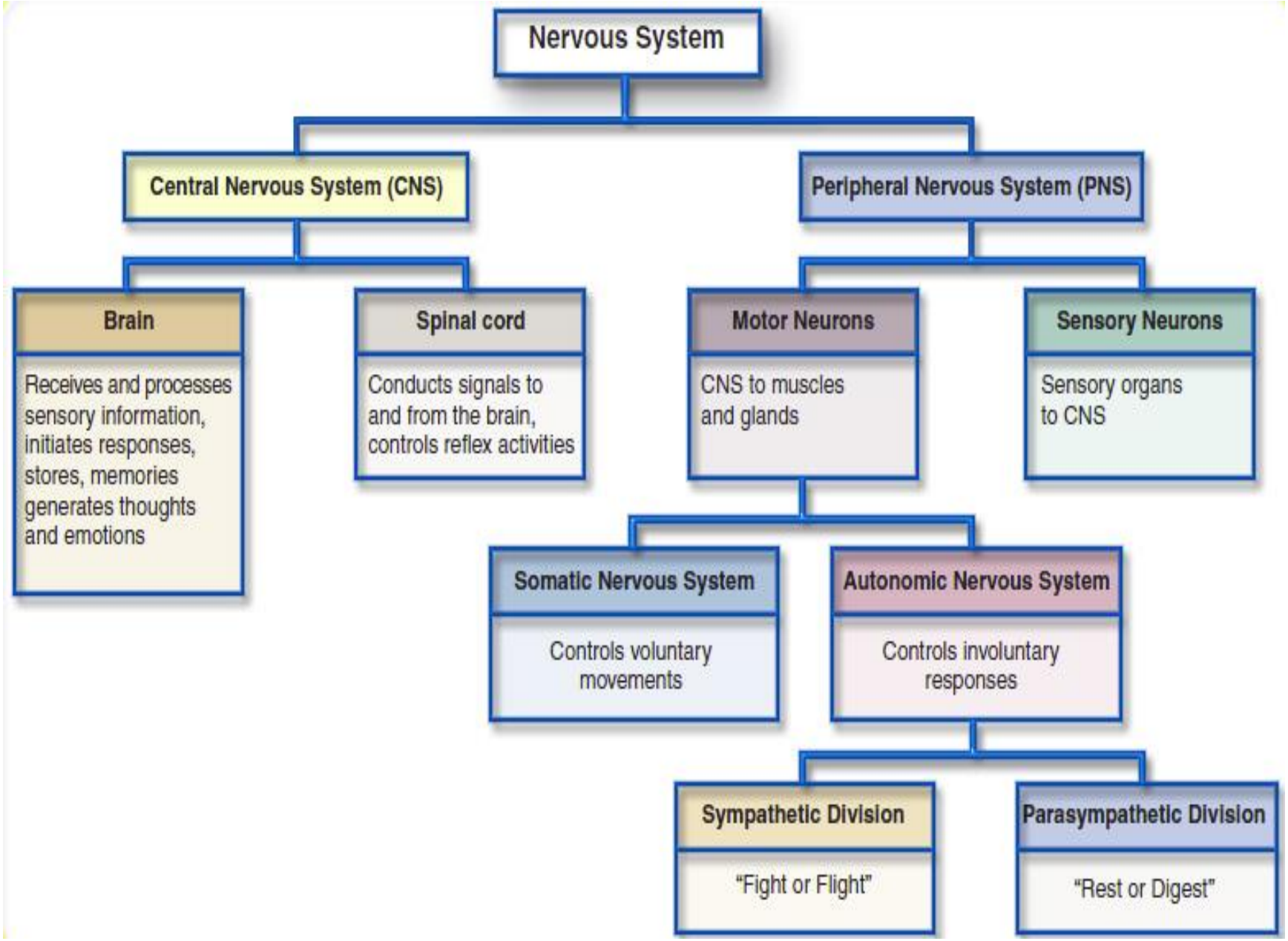
- Understanding language
- Behavior
- Memory
- Hearing

Cerebellum

- Balance
- Coordination and control of voluntary movement
- Fine muscle control

Brain Stem

- Breathing
- Body temperature
- Digestion
- Alertness/sleep
- Swallowing


Nervous System
Central Nervous System (CNS)
Peripheral Nervous System (PNS)
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
Motor Neurons
CNS to muscles and glands
Sensory Neurons
Sensory organs to CNS
Somatic Nervous System
Controls voluntary movements
Autonomic Nervous System
Controls involuntary responses
Sympathetic Division
"Fight or Flight"
Parasympathetic Division
"Rest or Digest"

NERVOUS SYSTEM

The nervous system is the major controlling system of the body. It responds to different sensory stimuli and transmits them to muscles and glands which bring about the required changes in the body. The nervous system has the ability to receive and store sensory information for processing. This information is used as experience to take action in response to such sensory stimuli for second time in a more skillful way.

CLASSIFICATION OF NERVOUS SYSTEM

It consists of central nervous system and the peripheral nervous system. The brain and spinal cord are parts of central nervous system while all nerves and their associated ganglia are parts of peripheral nervous system. The peripheral nervous system is further subdivided into somatic (voluntary) and autonomic (involuntary) nervous system.

The brain is the main part of nervous system concerned with control of body system. It controls body activities by integrating nervous information received along with past experience to bring about the required changes in the body. The brain is composed of neurons, supporting cells, a ventricular system containing cerebrospinal fluid along with meningeal coverings.

.

Spinal cord, which lies in vertebral column, is the basic center of central nervous system which contains many reflex centers. It has ascending tracts which carries necessary sensory information to sensory part of cerebral cortex. The descending tracts control body movements. The spinal reflexes are mainly inhibited by higher centers and this inhibition of inhibition brings about the required changes in movements of different muscles.

The medulla oblongata is connected to the pons superiorly and spinal cord inferiorly. It has ascending (sensory) tracts, descending tracts (motor) and is related to last four cranial nerves

The pons is situated in front of medulla oblongata and behind the midbrain. It also contains nuclei of middle four cranial nerves.

Cerebellum is closely associated with pons. It helps in performing body actions smoothly and in a well-organized way keeping a good control on cerebral motor activities.

The midbrain connects the forebrain to the hindbrain. It has a narrow cerebral aqueduct which carries cerebrospinal fluid from third ventricle to fourth ventricle. The midbrain contains nuclei of third and fourth cranial nerves along with ascending and descending tracts. It is the least developed part of the brain as compared to forebrain and hind brain.

The thalamus is the main relay station of the body for most of the sensory information received from spinal cord or brain stem. It is related ventrally to hypothalamus which controls the body hormones and autonomic nervous system.

CEREBRUM

The cerebrum is greatly enlarged part of brain that overhangs other parts and consists of two cerebral hemispheres connected by a group of fibers called corpus callosum. It is surrounded by a layer of grey matter having a central core of white matter. The centrally placed white matter contains some masses of gray matter called the basal nuclei. It has lateral ventricular cavity which contain cerebrospinal fluid

PERIPHERAL NERVOUS SYSTEM

The peripheral nervous system is further subdivided into (a) Spinal nerves (a) Cranial nerves and (c) Autonomic nervous system.

SPINAL NERVES

Spinal nerves an important component of peripheral nervous system and composed of 31 pairs of spinal nerves which are mixed nerve containing sensory and motor fibers along with sympathetic component (Fig.9.1). (a) Cervical nerves = 8, (b) Thoracic nerves =12, (c) Lumber = 5, (d) Sacral = 5, (e) Coccygeal =1

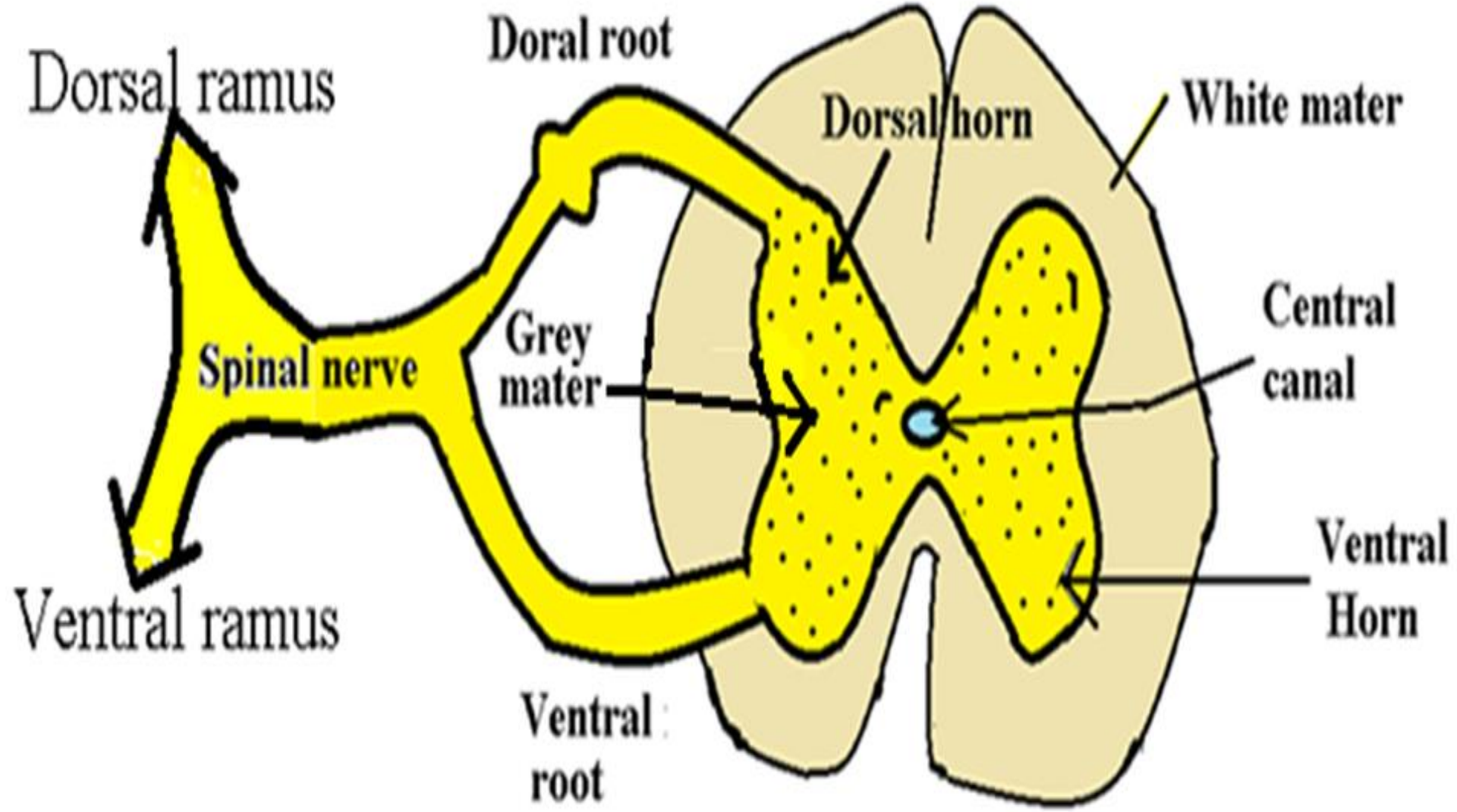


Fig. 9.1. Spinal nerve with section of spinal cord.

It is formed by anterior motor root and the posterior sensory root which join together to form a spinal nerve. The spinal nerve divide into dorsal or ventral branches called anterior ramus and posterior ramus. The dorsal ramus supply the skin and muscles over spinal cord and ventral ramus supply skin and muscle over anterior part of body wall.

THE CRANIAL NERVES

There are 12 pairs of cranial nerves which may be sensory, motor or mixed:

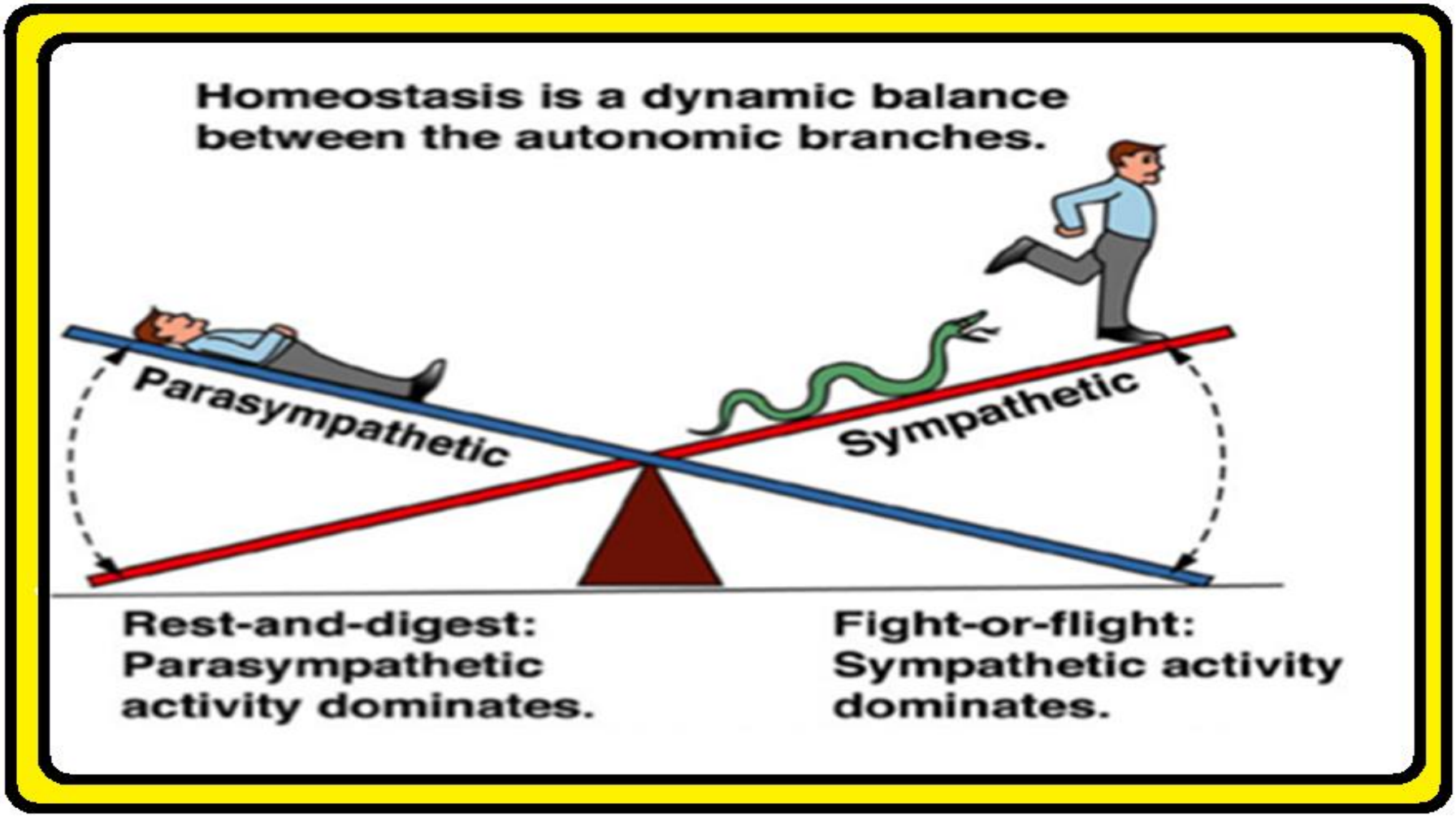
The following are examples of sensory nerves: Olfactory, optic, vestibulocochlear nerves are I, II, VIII cranial nerves respectively. These nerves are concerned with smelling, looking and hearing respectively.

The motor nerves are oculomotor, trochlear, abducent, accessory, hypoglossal nerves also called III, IV, VI, XI and XII cranial nerves. The nerves which can move eye (III, IV, VI CN), flexes head (XI CN) and move the tongue (XII CN).

All the remaining are mixed nerves, named as, the trigeminal, facial, glossopharyngeal and vagus nerves which are V, VII, IX and X cranial nerves which can masticate (V CN), move face (VII CN), taste food (IX CN) and move the intestine (X CN).

The motor nucleus of cranial nerve can be presumed as counterpart of ventral horn of spinal cord and sensory nucleus of cranial nerves as dorsal horn of spinal cord.

AUTONOMIC NERVOUS SYSTEM



AUTONOMIC NERVOUS SYSTEM

This nervous system concerned with the innervation of involuntary structures. Examples: (1) Heart, (2) Smooth muscle, (3) Glands. It is divided into sympathetic and parasympathetic parts. The hypothalamus mainly controls the activities of parasympathetic and sympathetic nervous system which also regulate the concerned endocrine glands. The comparison of parasympathetic and sympathetic system is given in table 9.1.

SYMPATHETIC NERVOUS SYSTEM

The sympathetic part of the autonomic system prepares us for fight or flight and called thoracolumbar outflow. Functions: (1) Accelerates of heart rate, (2) Increases blood flow to skeletal muscles, brain, heart and lungs, (3) Raises blood pressure, (4) Decreases blood flow to skin, intestine and kidney to divert blood to skeletal muscles, (5) Decreases peristalsis and closes the sphincters (constipation) and urine retention.

PARASYMPATHETIC NERVOUS SYSTEM

The parasympathetic part deals with the conservation of energy. It is also called craniosacral outflow (cranial nerves III, VII, IX, X and S2, 3, 4) and activates all the systems concerning weight gain. Example: (1) Decreases of heart rate, (2) Decreases blood flow to skeletal muscles, brain and heart and lungs, (3) Lower the blood pressure, (4) Increases blood flow to skin, intestine and kidney, (5) Increases peristalsis relaxes sphincters to push food distally for digestion, absorption and defecation.

From the lateral gray horns of second, third, and fourth sacral segments of the spinal cord, axons leave the spinal cord in the anterior nerve roots of the corresponding spinal nerves. They then leave the sacral nerves and form the pelvic splanchnic nerves which synapse with peripheral parasympathetic ganglia to supply the smooth muscles of pelvis for parasympathetic activities.

The cranial preganglionic fibers of vagus nerve passes via thorax to reach the ganglion close to the wall of foregut and mid gut where after synapse, the postganglionic fiber supply the wall of proximal two third of gut wall etc. The ciliary, pterygopalatine, submandibular, and otic ganglia are related to other cranial nerves which supply the postganglionic parasympathetic fiber to structure in head and neck. The parasympathetic postganglionic fibers are nonmyelinated and short comparatively.

Table 9.1 Comparison of parasympathetic and sympathetic nervous system	
Parasympathetic NS	**Sympathetic NS**
Craniosacral outflow	Thoracolumbar out flow
Long preganglionic fibers and short postganglionic fibers start close to gut wall.	Short preganglionic fibers and long postganglionic fibers start away from gut wall.
Only cholinergic nerve ending and supplies internal viscera and has no supply to structures in body wall or limbs.	Commonly adrenergic nerve ending and supplies smooth muscles of both internal viscera and vessels of body wall and limbs
It deals with relaxed condition which leads to increase in body weight due to increased activities of digestion and absorption.	It deals with condition like fight or flight leading to decrease in body weight and decreased processes of digestion and absorption

Table 9.1 Comparison of parasympathetic and sympathetic nervous system.

Functions of ANS

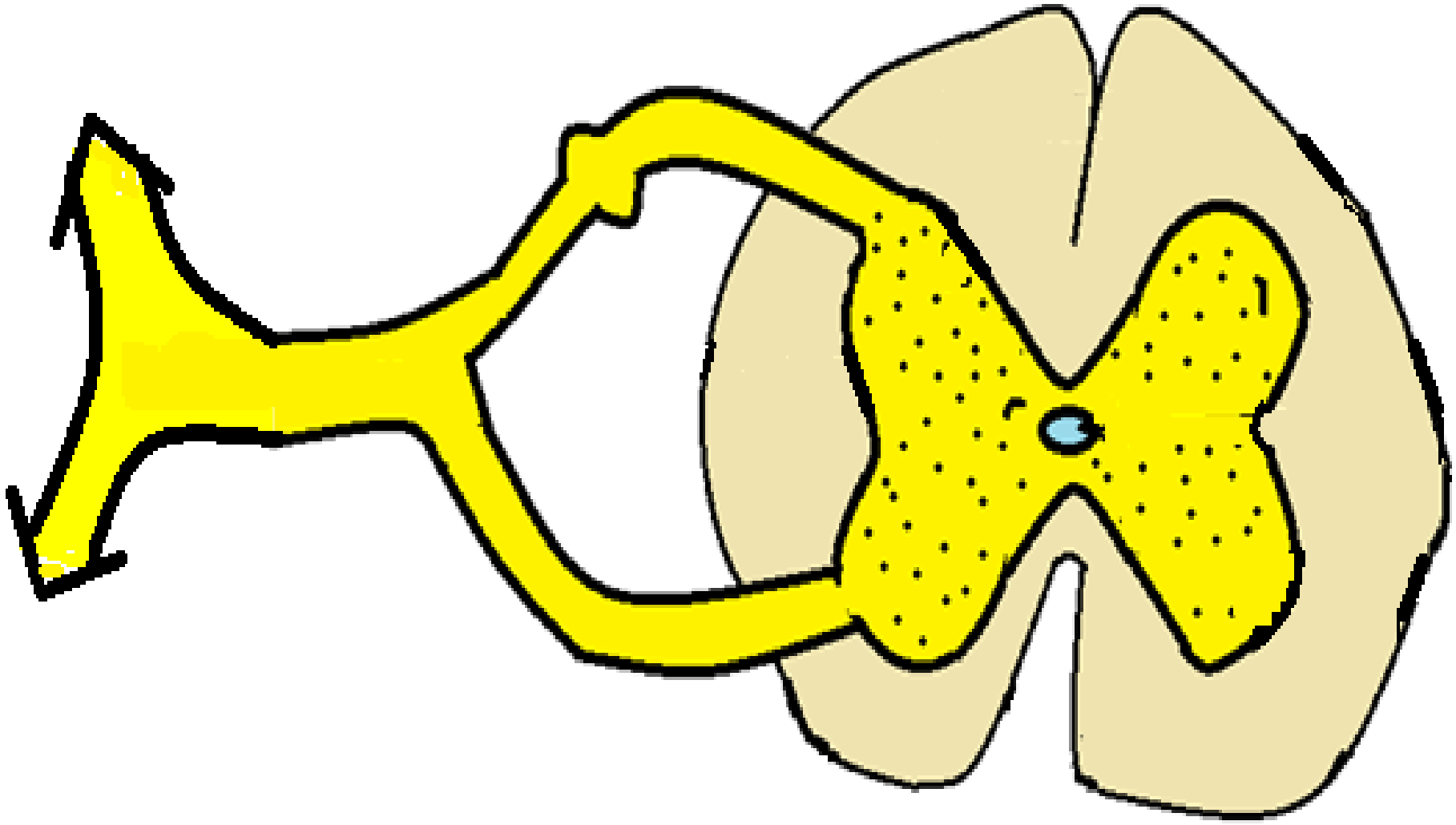
Sympathetic

- Heart
  - ↑ heart rate
  - ↑ force of contraction
- Blood vessels
  - *Constriction*
- Lungs
  - Bronchodilation
- GIT
  - ↓ motility
  - Sphincter contraction
  - Decreased secretions

Parasympathetic

- Heart
  - ↓ heart rate
  - ↓force of contraction
- Blood vessels
  - No effect
- Lungs
  - Bronchoconstriction
- GIT
  - ↑ motility
  - Sphincter relaxation
  - Increased secretions

Practical 1. Label the diagram



Practical 2: Write a few major features of following structures.

- Spinal cord
- Cerebrum
- Cerebellum
- Thalamus
- Hypothalamus
- Spinal nerves
- Cranial nerves

THANKS