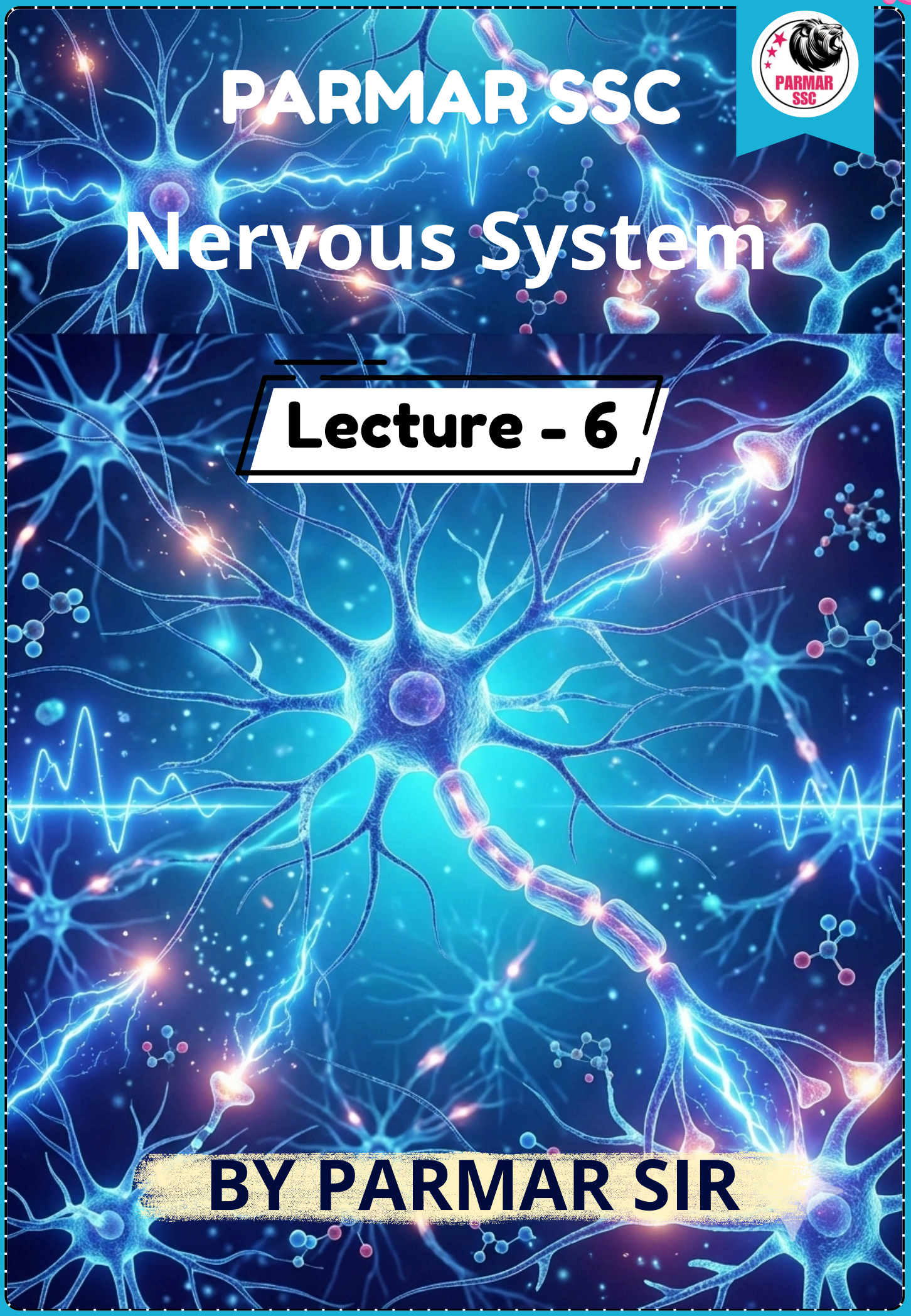
PARMAR SSC

Nervous System

Lecture - 6

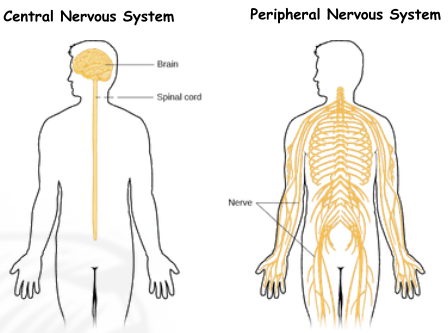


BY PARMAR SIR

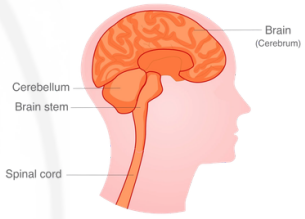
Nervous System

- The nervous system is a complex network of cells and nerves that controls and coordinates the body's functions.
- It includes the brain, spinal cord, and all the nerves that connect these organs to the rest of the body.
- The Nervous System is broadly divided into two main categories:

1. **Central Nervous System (CNS):** The core processing center, consisting of the Brain and the Spinal Cord.
2. **Peripheral Nervous System (PNS):** The vast network of nerves that emanate (branch out) from the brain and spinal cord, connecting the CNS to the rest of the body.



Central Nervous System



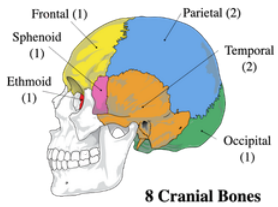
- The central nervous system (CNS) is the body's primary control center, responsible for processing information and coordinating bodily functions.
- It's made up of the brain and the spinal cord.

Functions of CNS

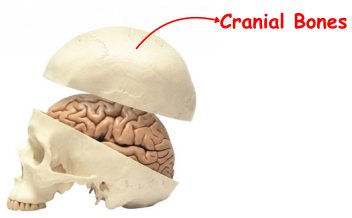
- Collects signals from sense organs (eyes, ears, skin, etc.)
- Controls voluntary (walking, writing, speaking, etc.)
- CNS plays a crucial role in thermoregulation, the process of maintaining a stable body temp.
- sends signals to muscles and glands to respond appropriately.
- controls involuntary movements (heartbeat, digestion, etc.).
- CNS specifically the hypothalamus, plays a crucial role in controlling both hunger and thirst.

The Human Brain

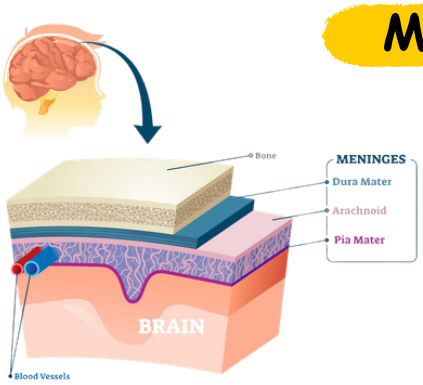
- The human brain is the main organ of the central nervous system (CNS).
- It is protected by the skull and surrounded by cerebrospinal fluid.
- It controls all body functions, including movement, emotions, thoughts, memory, and senses.
- Inside the skull, the brain is covered by the cranial meninges.



8 Cranial Bones



Meninges consists of three layers

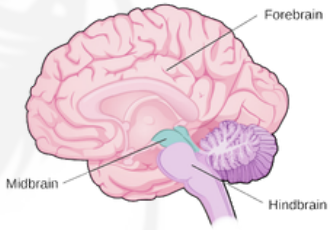


- **Dura Mater:** Outer layer.
- **Arachnoid Mater:** A very thin middle layer.
- **Pia Mater:** Inner layer (which is in contact with the brain tissue).

Pain receptors are present in meninges

- The Average Human brain weight around 1300g - 1400g in males and 1200g - 1400g in females).
- **Why don't we feel this heavy weight?**
  - Inside the skull, the brain floats in a specialized liquid called Cerebrospinal Fluid (CSF). Due to the physics of buoyancy, this floating mechanism reduces the brain's effective weight down to merely 50 grams!
- The adult brain accounts for mere of 2% of body weight but consumes: 20% : O_2
- 20-25%: Glucose (Our brain demands half of the sugar energy).

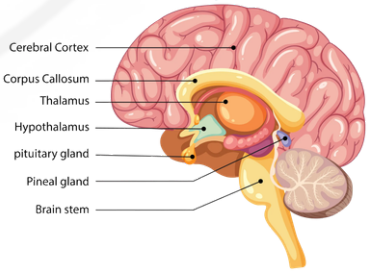
The human brain can be divided into three major parts:



1. **Forebrain** - The front portion.
2. **Midbrain** - The middle portion.
3. **Hindbrain** - The rear portion.

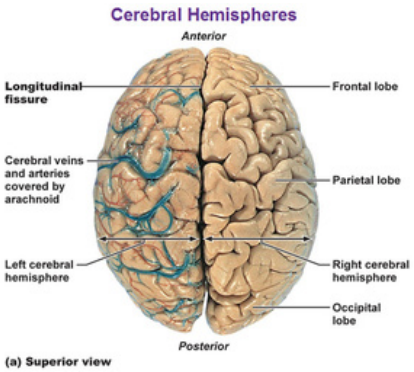
1 Forebrain

- The "forebrain" refers to the anterior (front) part of the brain, and it's the largest section of the brain.
- It controls all the voluntary movements and higher-level cognitive functions like thinking, memory, and consciousness.
- The forebrain is divided into three main components:
  1. Cerebrum
  2. Thalamus
  3. Hypothalamus.



1. Cerebrum

- It is the largest part of the brain.
- The left and right cerebral hemispheres are connected by a thick band of nerve fibers called the corpus callosum.
- The outer layer of cell, which covers the cerebral hemisphere is called cerebral cortex (referred to as grey matter due to its greyish appearance).
- Cerebrum is responsible for memory and learning.



2. Thalamus

- It is the major coordinating centre for sensory and motor signaling.
- Thalamus works as a "Relay Station", it takes information from the body and sends it further to cerebral cortex (Body senses → Thalamus → Cerebral cortex).
- Touch, taste, sound these senses are processed by Thalamus to Cerebral Cortex.

3. Hypothalamus

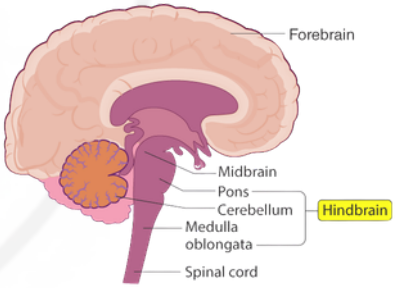
- Hypothalamus lies at the base of thalamus.
- It controls Automatic Nervous System and is required for regulating inner body temperature, appetite, thirst and fever.
- It contains several groups of neurosecretory cells, which secretes hormone called hypothalamic hormones.

2 Midbrain

- It is located between Hypothalamus of forebrain and pons of hindbrain.
- It is involved in several functions such as: Motor control, particularly eye movements and processing of vision and hearing.

3 Hind Brain

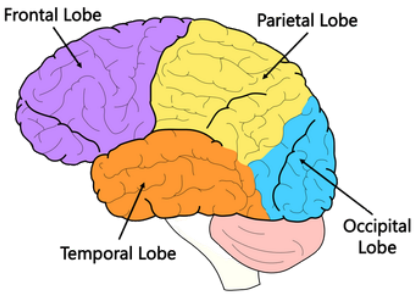
- Parts of Hind Brain: Pons, Cerebellum, Medulla Oblongata.



1. **Pons** - It is the middle portion of the brain that coordinates face and eye movements, facial sensations and hearing.
2. **Cerebellum** - It maintains body posture and balance, and is also known as "little brain".
3. **Medulla Oblongata** - It is connected to the spinal cord. It controls involuntary actions like respiration, heartbeat, and gastric secretions.

Lobes of the Brain

- **The brain is divided into four main lobes:** frontal, parietal, temporal, and occipital.



1. Frontal Lobe

- **Location:** Front of the brain.
- **Functions:** Reasoning, planning, problem-solving, motor control, emotional regulation

2. Parietal Lobe

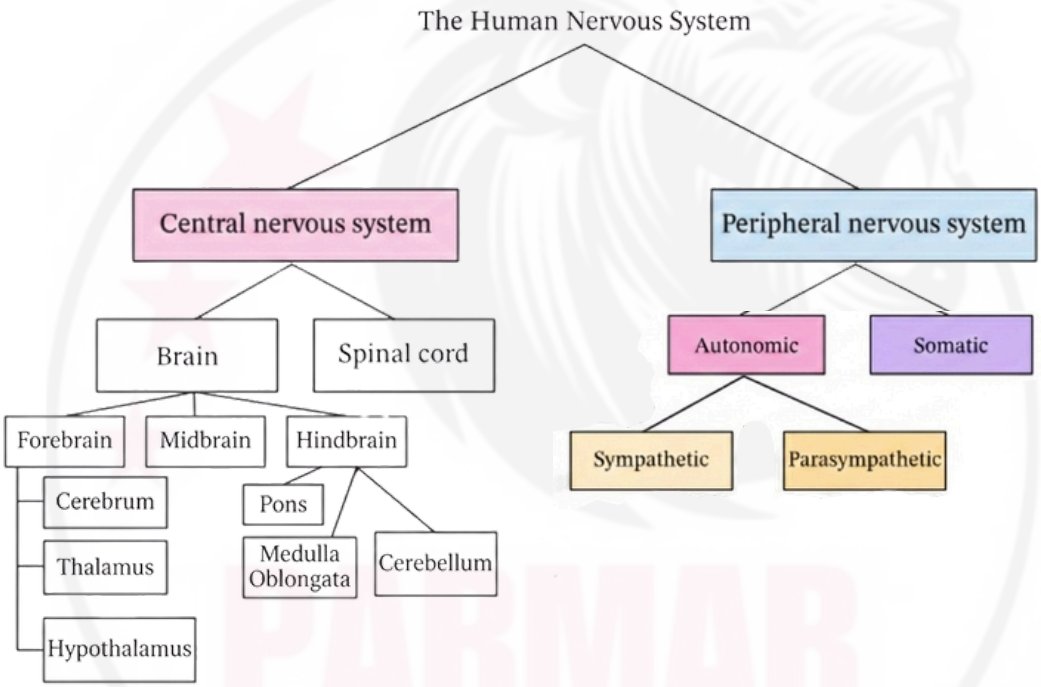
- **Location**: Behind the frontal lobe.
- **Functions**: Processes sensory information (touch, pain, temperature), spatial awareness.

3. Temporal Lobe

- **Location**: Sides of the brain.
- **Functions**: Auditory processing, language comprehension, memory, emotions.

4. Occipital Lobe

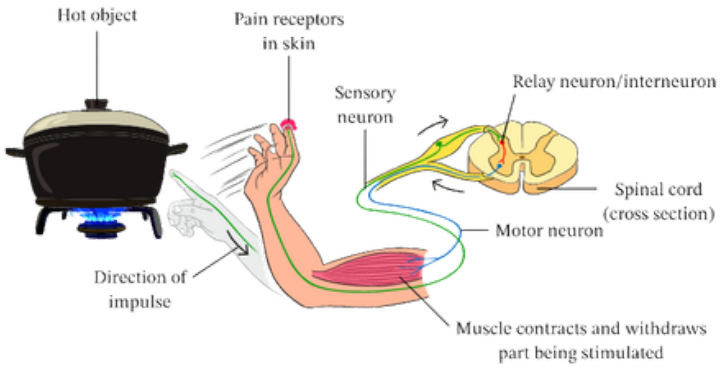
- **Location**: Back of the brain
- **Functions**: Visual processing, understanding spatial relationships.

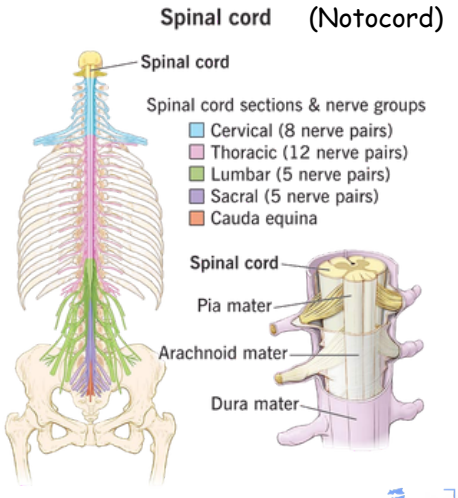


Spinal Cord

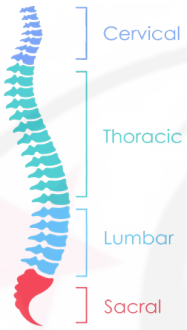
- The spinal cord transmits signals from the brain to the body and sensory information from the body back to the brain.
- It also plays a role in coordinating reflexes.
- The Spinal Cord is divided into three parts.

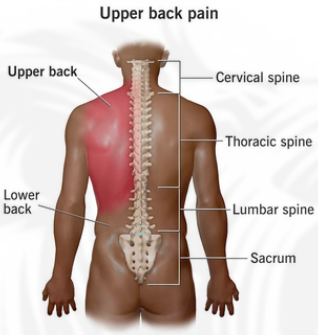
1. Cervical- Neck
2. Thoracic- Upper back
3. Lumbar- Lower back



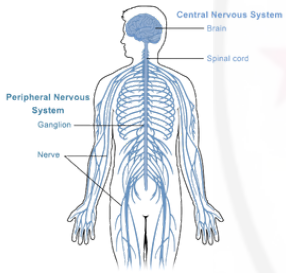


- There are a total of 31 pairs of nerves connected to the spinal cord.
  - **Cervical**- 8 nerve pairs
  - **Thoracic**- 12 nerve pairs
  - **Lumbar**- 5 pair of nerves
  - **Sacral**- 5 pair of nerves
- The final nerve is a bundle at the base of spine called "**cauda equina**" that gives sensation to your lower body.





Peripheral Nervous System (PNS)



- The peripheral nervous system (PNS) is a network of nerves that extends from the CNS (brain and spinal cord) throughout the body, connecting it to all other parts.

1. Types of Peripheral Nervous System (PNS)

1. Somatic Nervous System

- The somatic nervous system is a part of the peripheral nervous system that controls voluntary movements of skeletal muscles and receives sensory information from the skin, muscles, and joints.

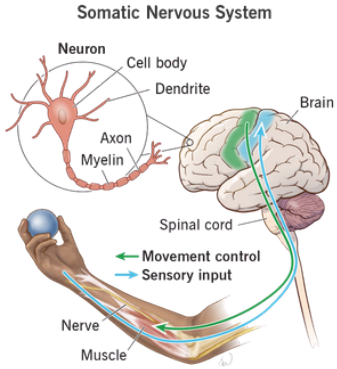
Types of Somatic Nervous System

a). Sensory Nervous System

- They carry information from body organs to CNS. They are also known as Afferent Nerves.

b). Motor Nervous System

- They carry information from CNS to body organs. They are also known as Efferent Nerves.



2. Automatic Nervous System

- The autonomic nervous system is a part of the peripheral nervous system that regulates involuntary physiologic processes including heart rate, blood pressure, respiration, digestion, and sexual arousal.

Types of Automatic Nervous System

a). Sympathetic Nervous System

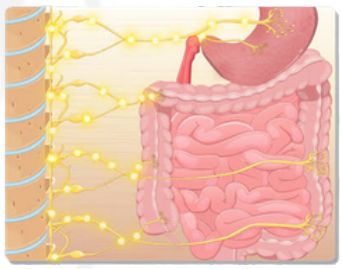
- They control the body's "**Flight-or-Fight**" response (help you in times of need, such as danger or stress).

b). Parasympathetic Nervous System

- They control the body's "**Rest and Digest**" response (It relaxes the body's system and return them to normal).

Enteric Nervous System (ENS)

- The gut contains trillions of neurons—even more than the entire Spinal Cord. This is why the ENS is called our "Second Brain."
- The gut and the main brain are connected by the Vagus Nerve (the longest nerve in the body). When you are stressed or anxious, the brain sends danger signals down this nerve. This instantly halts digestion, resulting in an upset stomach or loose motions.
- 90% to 95% of Serotonin (the chemical responsible for regulating mood and happiness) is produced in the gut.



Brain Diseases

Meningitis

- Meningitis is a serious medical condition where the protective membranes (called meninges) covering the brain and spinal cord become inflamed.

Alzheimer's Disease

- Alzheimer's disease is a progressive brain disorder that slowly destroys memory, thinking skills, and the ability to carry out simple tasks. It is the most common cause of dementia (loss of memory) in older adults.

Amnesia

- Amnesia is a condition where a person loses their memory, either partially or completely. It affects a person's ability to remember past experiences or form new memories.



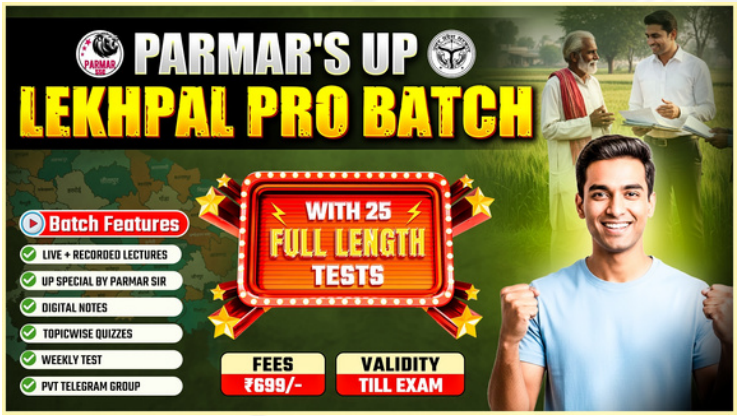


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