Your Nervous System

Central Nervous System

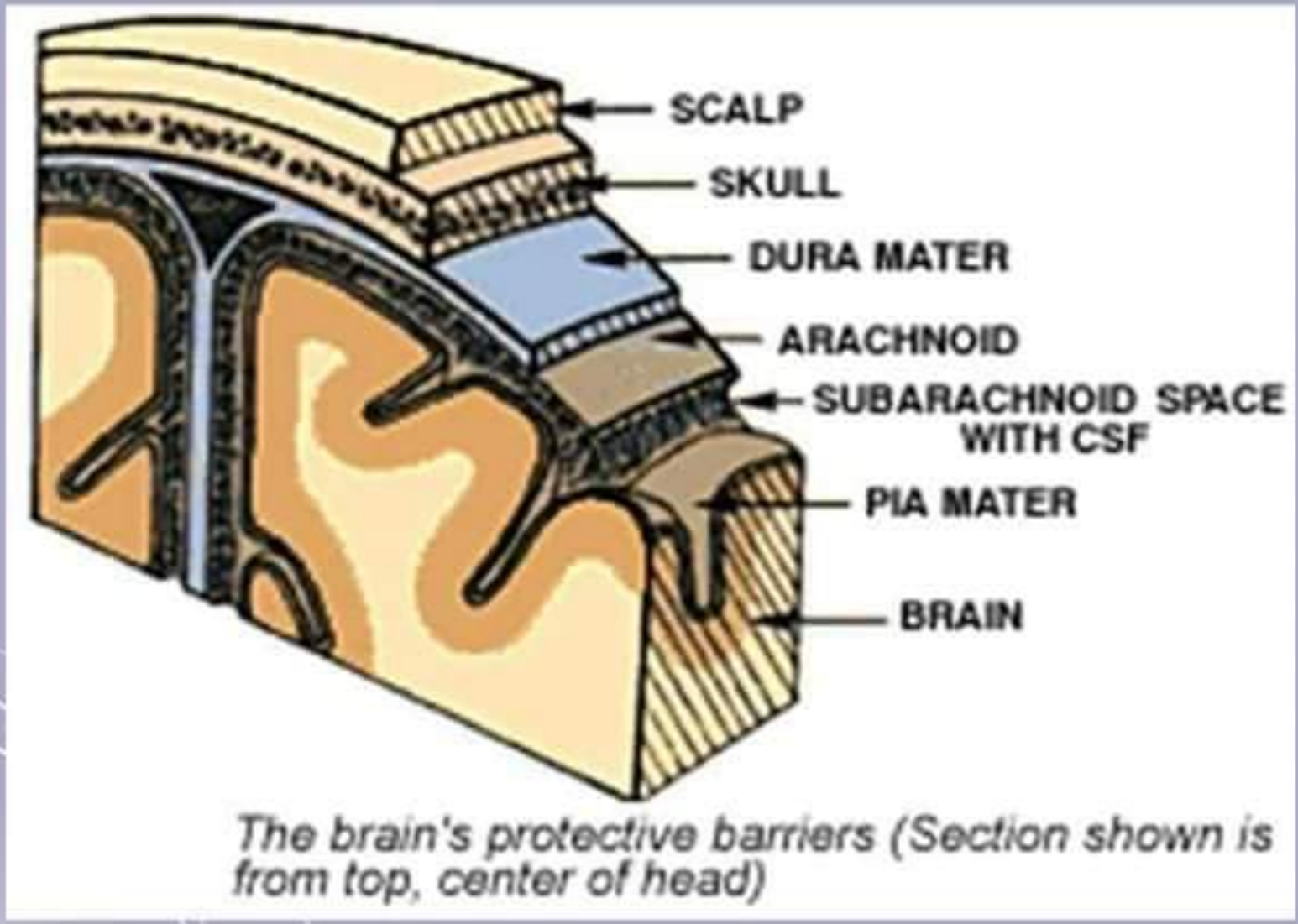
Parts of CNS

1. The **Spinal Cord**
2. The **Brain**

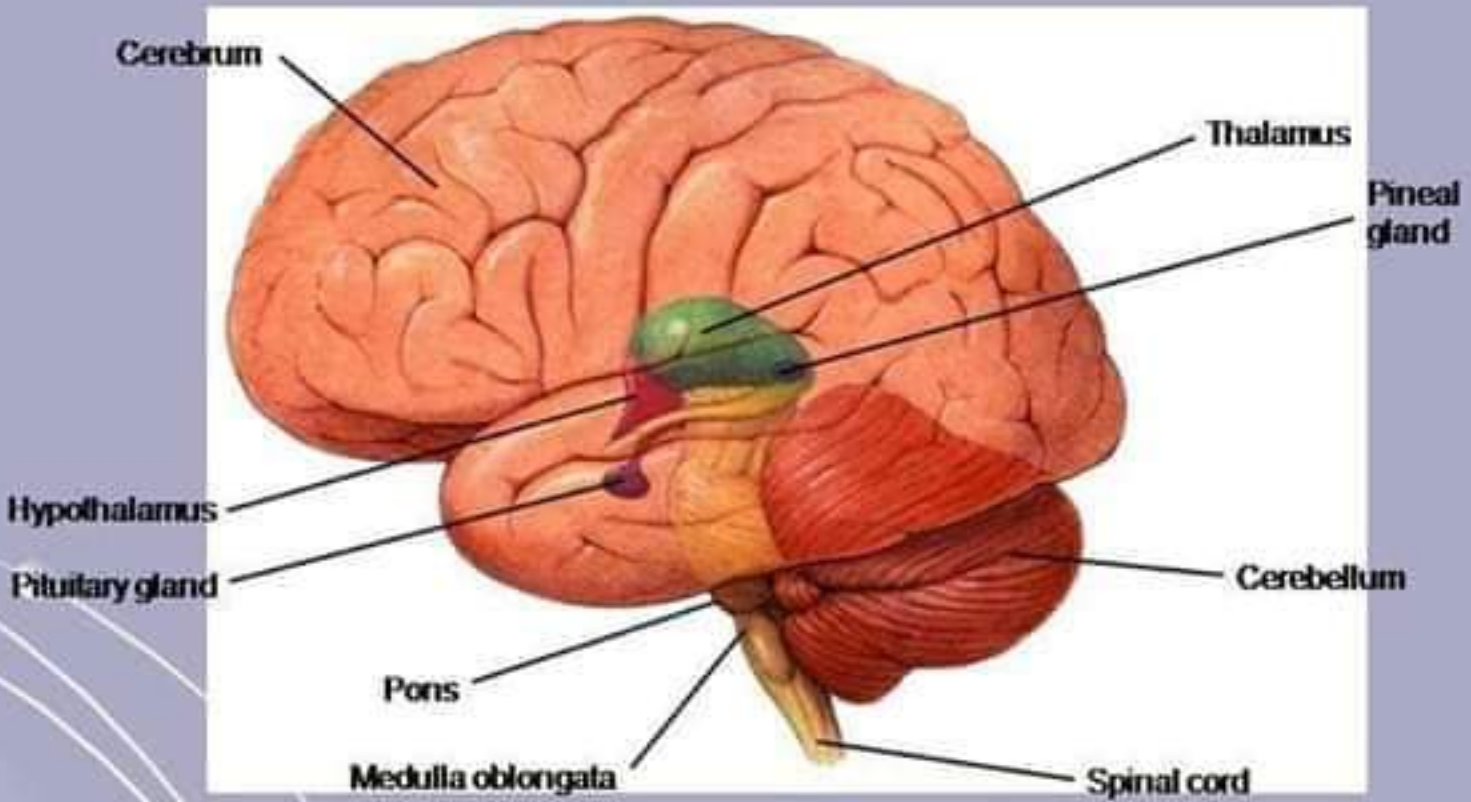
Protections

- Skull and Vertebrae
- **3** protective layers called **meninges**

1. **Dura Mater** (outer layer): consists of connective tissues, blood vessels, and nerves.
2. **Arachnoid Layer** (middle layer): elastic and weblike
3. **Pia Mater** (inner layer): contains nerves and blood vessels.
4. **Cerebrospinal fluid**
   - a clear watery liquid
   - separates the middle and inner layers
   - Acts as shock absorber
   - exchange of nutrients between blood and nervous system

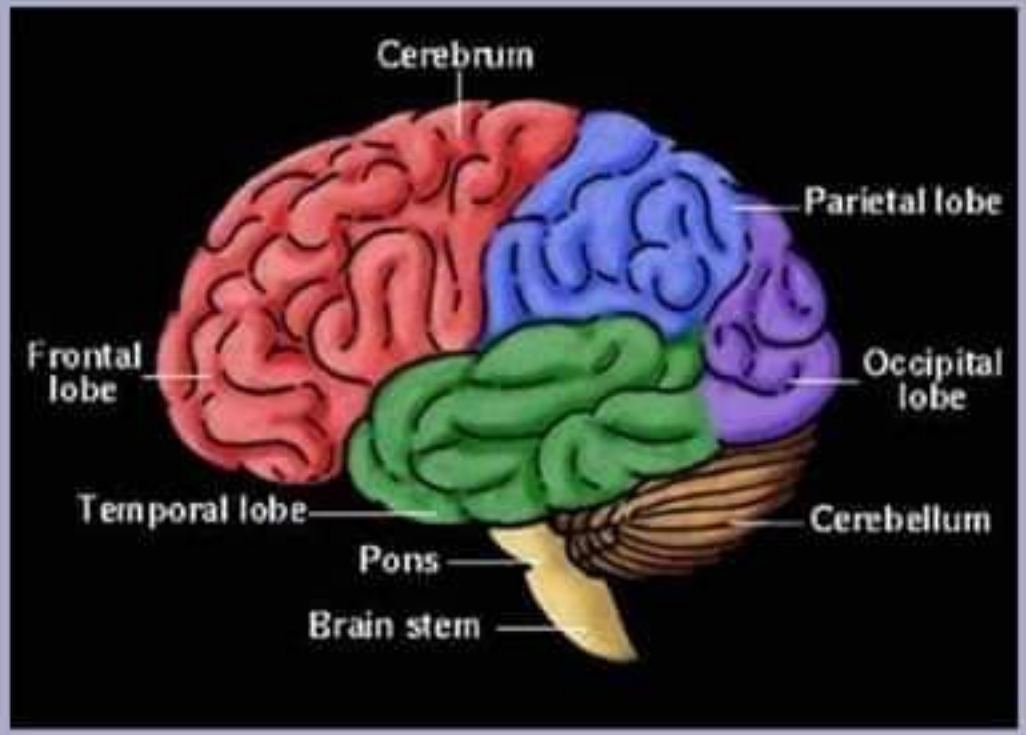


The brain's protective barriers (Section shown is from top, center of head)


Cerebrum
Thalamus
Pineal gland
Hypothalamus
Pituitary gland
Cerebellum
Pons
Medulla oblongata
Spinal cord

The Brain

- The brain is the **control center** of the **body**
- It is about **2%** of your body **weight** and uses **20%** of your body's **oxygen**

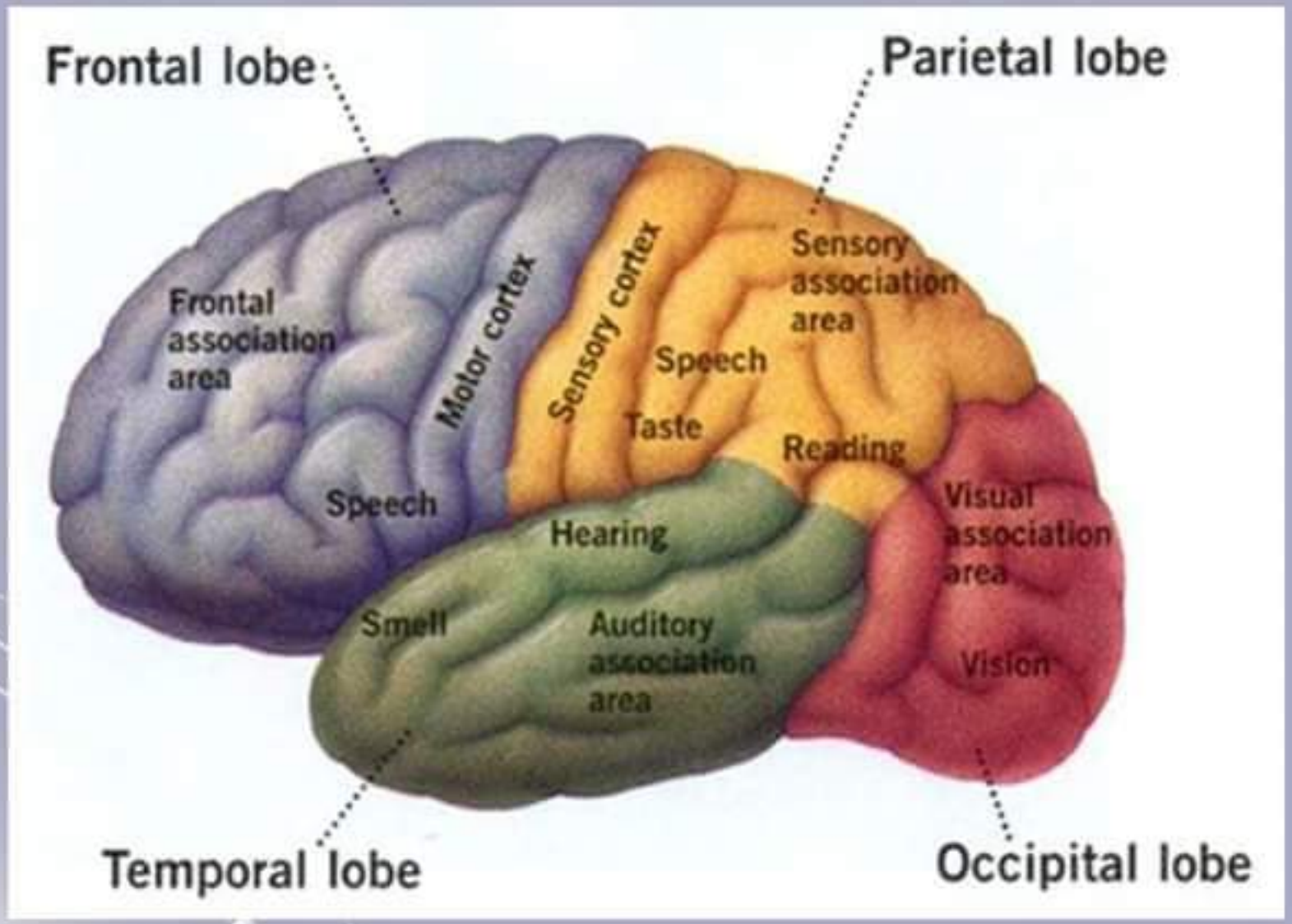


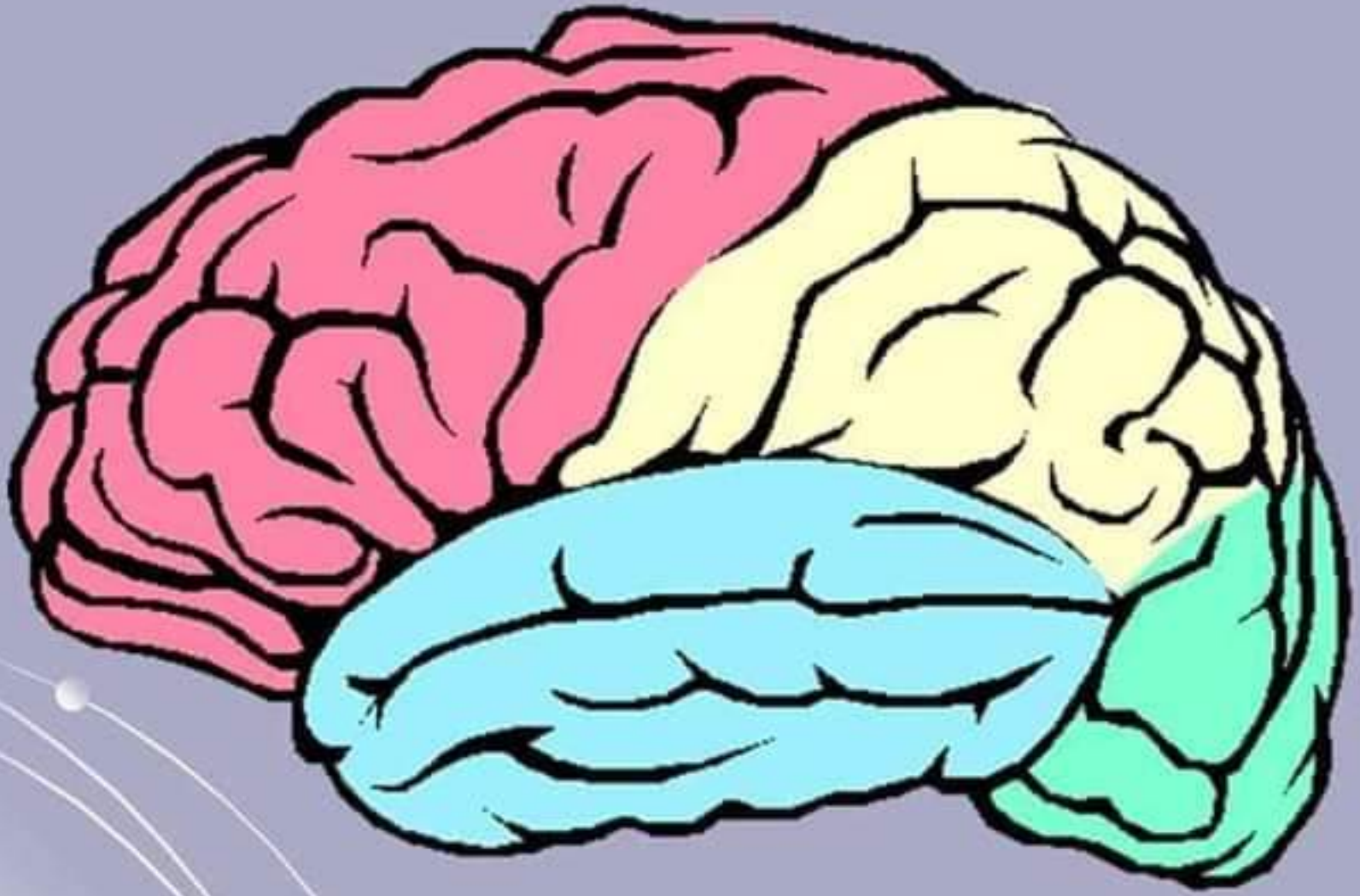
Parts of the Brain

- Divided into **three** parts
  - Cerebrum
  - Cerebellum
  - Brain Stem

Cerebrum

1. **Largest** part of the brain
   – Learning and Senses
- **2 hemispheres**- Right and Left
- Connected by the **Corpus Callosum**
- **Right side** controls- **left side**
- **Left side** controls – right side of body
- Four sections - **LOBES**
  1. **Frontal** Lobe
  2. **Parietal** Lobe
  3. **Occipital** Lobe
  4. **Temporal** Lobe


Frontal lobe
Parietal lobe
Frontal association area
Motor cortex
Sensory cortex
Sensory association area
Speech
Taste
Reading
Speech
Hearing
Visual association area
Smell
Auditory association area
Vision
Temporal lobe
Occipital lobe

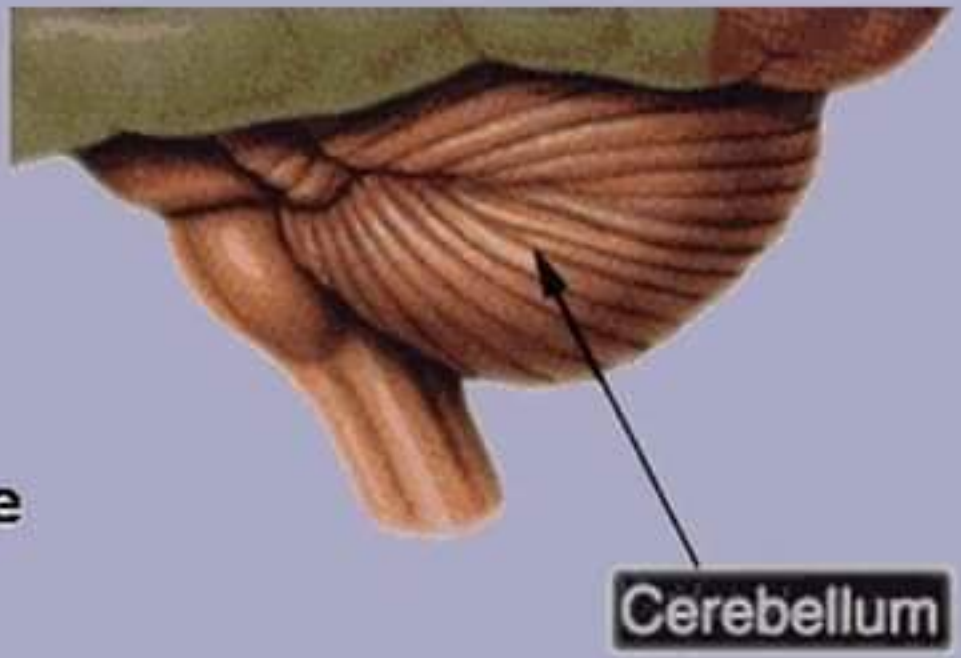


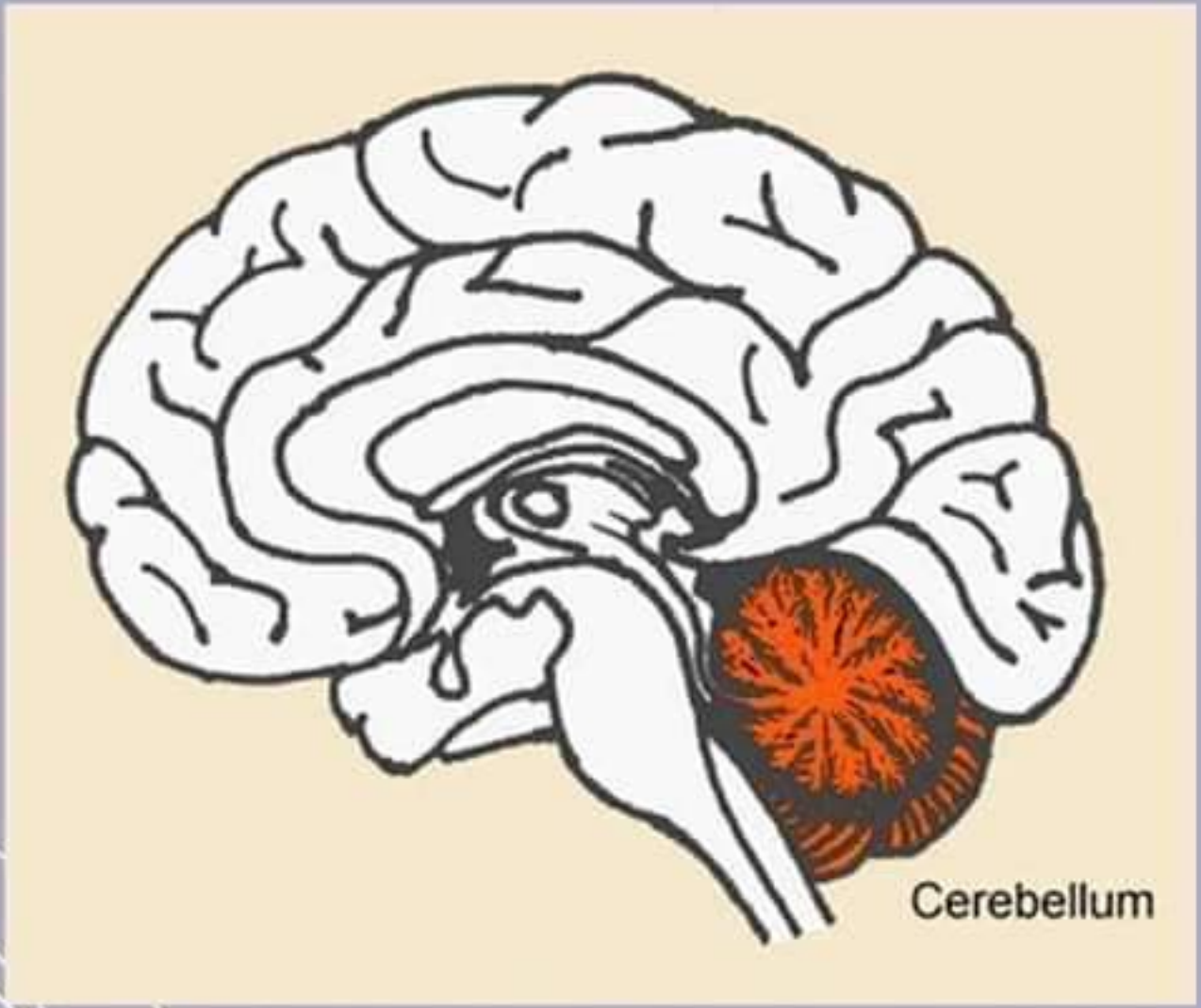
Gray Matter vs. White Matter

- **Gray Matter** – Absence of myelin in masses of neurons accounts for the gray matter of the brain – **Cerebral Cortex**
- **White Matter** - Myelinated neurons gives neurons a white appearance – inner layer of cerebrum

Cerebellum

- Second largest
- located **below** the cerebrum at back of skull
- This part is responsible for the **balance** and **muscle** coordination



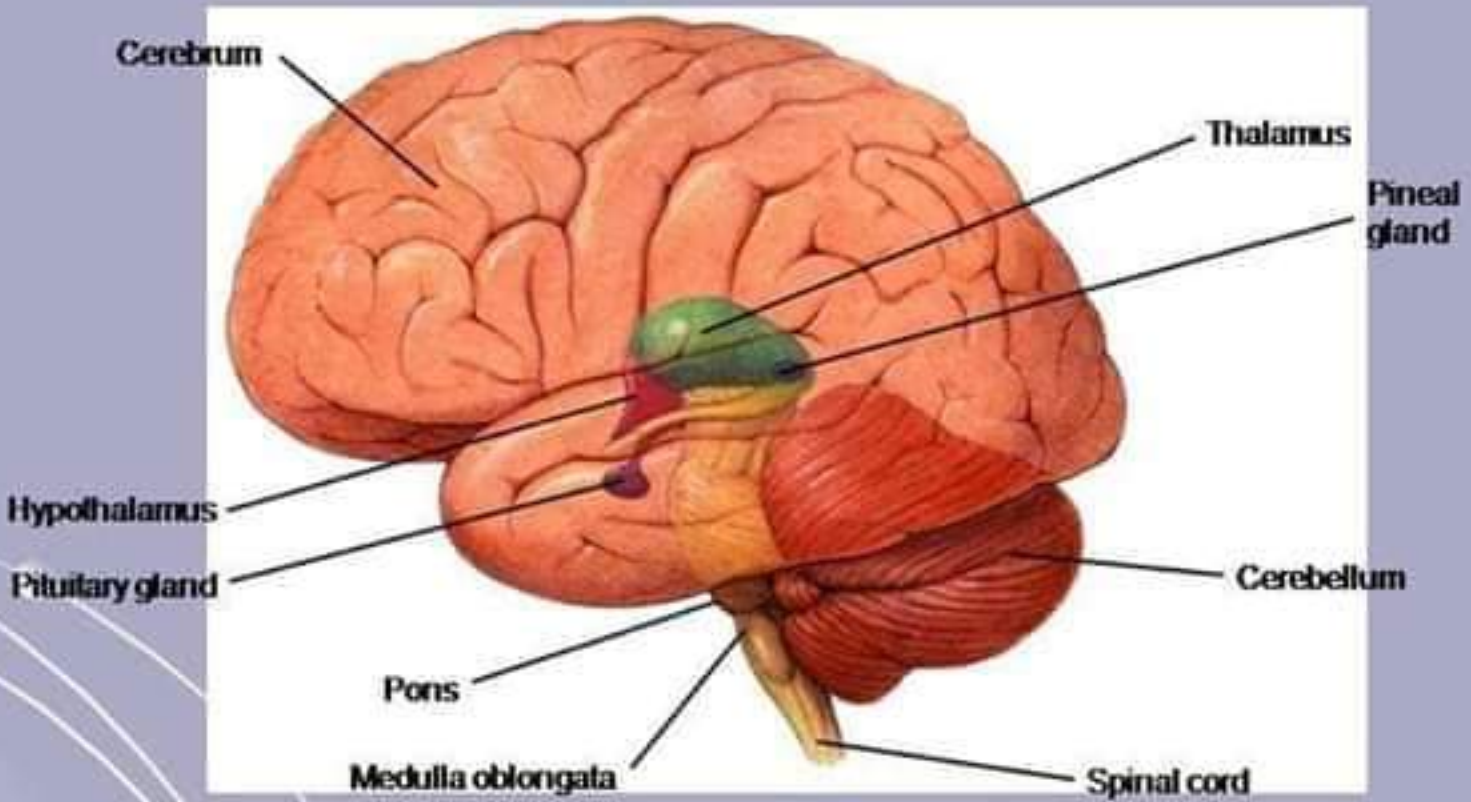

Cerebellum

Brain Stem

- Connects the **brain to spinal cord**
  - The **Two Regions** act as "switchboard"
    - **Medulla Oblongata** – Controls heart rate, breathing rate, and flow of blood through the blood vessels.
    - **Pons** – Relays signals between the cerebrum and the cerebellum

Other Structures inside the Brain

- **Thalamus** – receives messages from sensory receptors; relays information to proper regions of cerebrum
- **Hypothalamus** - Regulates hunger, thirst, fatigue, anger, etc…
  - Control of pituitary for endocrine function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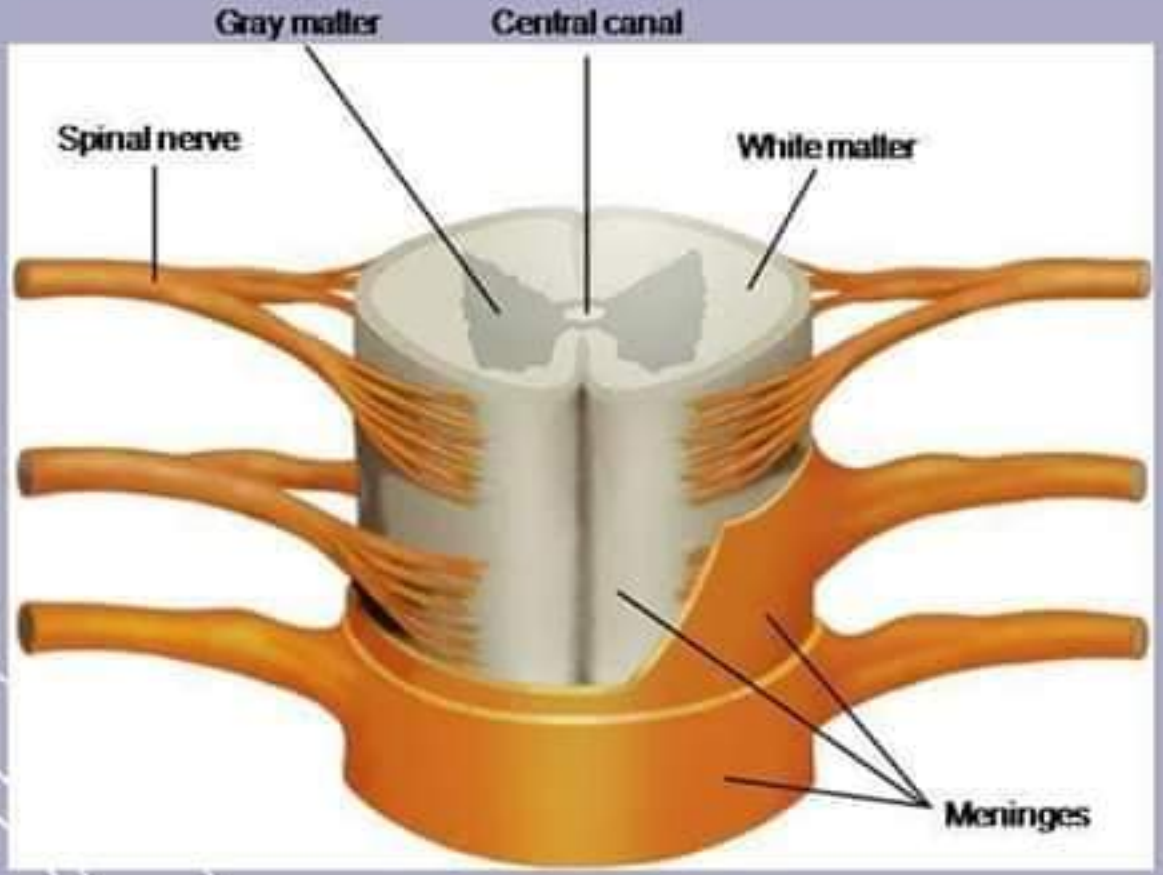
Spinal cord

Cross Section of the Spinal Cord



Spinal Cord

- Link between brain and rest of body (PNS)
- 31 pairs of spinal nerves
- Reflexes processed directly by spinal cord
- **Reflex** – quick, automatic, unconscious responses
  - Result of **reflex arcs** – shortest nerve pathways

Elaboration

- **Nicotine in the Body and Brain**

Drugs and the Nervous System

- Drug – any substance, other than food that changes the structure or function of the body
- Legal
- Illegal

Drugs That Affect the Synapse

Commonly Abused Drugs

Section 25.6

Drug Type	Medical Use	Examples	Effects on the body
Stimulants	Used to increase alertness, relieve fatigue	Amphetamines	Increase heart and respiratory rates; elevate blood pressure; dilate pupils; decrease appetite
Depressants	Used to relieve anxiety, irritability, tension	Barbiturates Tranquilizers	Slow down the actions of the central nervous system; small amounts cause calmness and relaxation; larger amounts cause slurred speech and impaired judgement
Opiates	Used to relieve pain	Morphine Codeine	Act as a depressant; cause drowsiness, restlessness, nausea

1. Stimulants

- Increase
  - Heart rate
  - Blood pressure
  - Breathing
  - Release of neurotransmitters at some synapses in the brain
- Deplete neurotransmitters and lead to:
  - Fatigue
  - Circulatory problems
  - Hallucinations
  - Depression

2. Depressants

- Decrease
  - Heart rate
  - Breathing rate
  - Blood pressure
  - Relax muscles
  - Relieve tension
- Enhances release of neurotransmitters that prevent nerves cells from firing
- Alcohol with depressants can lead to death – depresses CNS to a point one stops breathing

3. Opiates

- Mimics endorphins
- **Endorphin** – natural chemical in brain that helps overcome pain
- When person stops taking
  - Brain has adjusted to high levels of endorphins
  - Cannot produce enough natural endorphins
  - Suffer uncontrollable pain and sickness

4. Cocaine

- Sudden release of **Dopamine**
- Powerful Stimulant
- Increases heart rate and blood pressure
- First time users can have heart attack
- **Dopamine** – neurotransmitter in brain that is released to give feeling of pleasure and satisfaction

5. Marijuana

- Active ingredient (THC) tetrahydrocannabinol
- More destructive to lungs than cigarettes
  - 5 marijuana cigs = 120 conventional cigs

- Results in:
  - Lower WBC count by 40% - susceptible to infections
  - Teens –
    - inhibits maturity
    - Retards normal brain growth
      - Memory loss
      - Inability to concentrate
      - Fall short on memory as well as math and verbal skills
  - Males – reduced testosterone levels and increases estrogen levels
  - Females –
    - disturbs menstrual cycle
    - DNA damage to eggs

More Effects (FYI)

- Impaired perception
- Loss of coordination
- Increased risk of accidents
- Impaired judgement
- Loss of motivation
- Diminished inhibitions
- Increased heart rate
- Anxiety, panic attacks, and paranoia
- Hallucinations
- Damage to the respiratory, reproductive, and immune systems
- Increased risk of CANCER
- Psychological dependency

6. Alcohol

- Depressant
- Slows down CNS
  - 40% of 50,000 highway deaths are caused by drinking and driving
  - 1/3 of homocides attributed to effects of alcohol
  - $150 billion dollars of U.S. economy alcohol abuse treatment
- Fetal Alcohol Syndrome (FAS)
  - Drinking while pregnant
  - Heart defects, malformed faces, delayed growth, poor motor development

Alcohol and Disease

- Long-term alcohol use or bouts of excessive consumption
  - Destroys liver cells
  - Cirrhosis of liver – formation of scar tissue that prevents blood flow through liver