

HUMAN ANATOMY AND PHYSIOLOGY-II

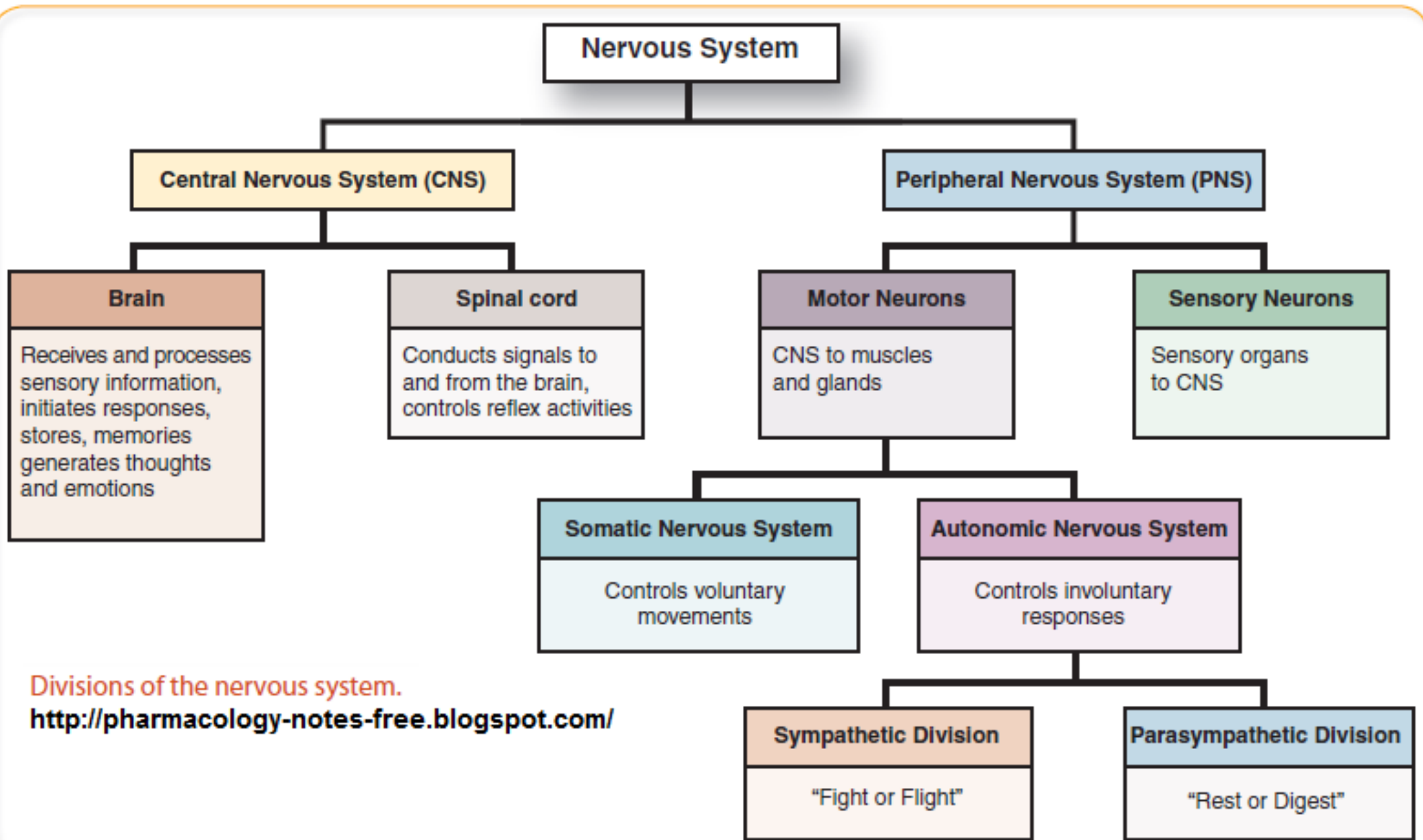
Central nervous system Meninges ventricles of brain and Cerebrospinal Fluid



Centurion
UNIVERSITY

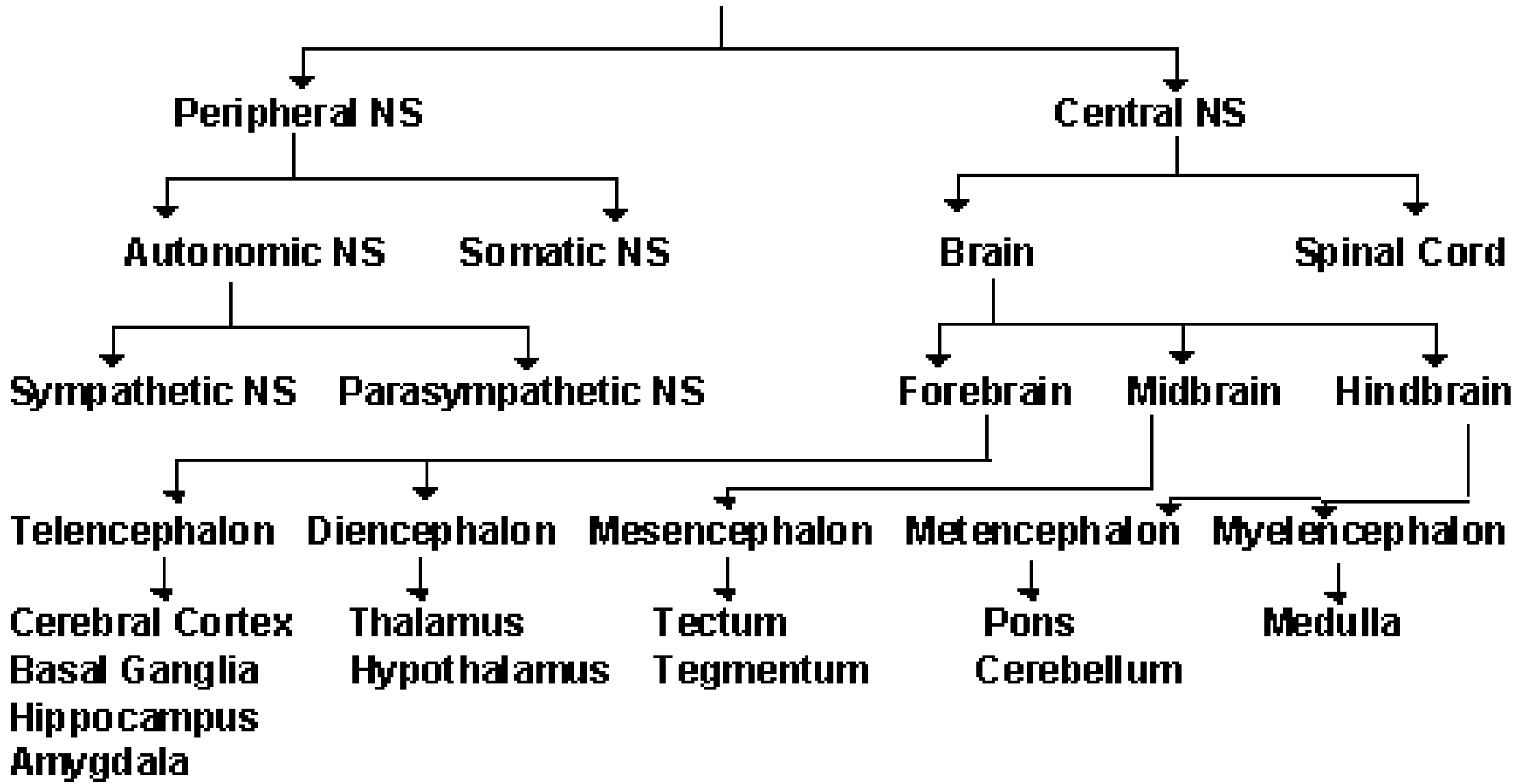
*Shaping Lives...
Empowering Communities...*

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Divisions of the nervous system.
<http://pharmacology-notes-free.blogspot.com/>

Nervous System (NS)



The meninges

- The brain and spinal cord are completely surrounded by three layers of tissue, the meninges, lying between the skull and the brain, and between the vertebral foramina and the spinal cord.
- Named from outside inwards they are the:
 - i. dura mater
 - ii. arachnoid mater
 - iii. pia mater

The dura and arachnoid maters are separated by a potential space, the subdural space. The arachnoid and pia maters are separated by the subarachnoid space, containing cerebrospinal fluid.

Dura mater

- Tough and outermost layer
- The cerebral dura mater consists of two layers of dense fibrous tissue.
- The outer layer takes the place of the periosteum on the inner surface of the skull bones and the inner layer provides a protective covering for the brain.
- Venous blood from the brain drains into venous sinuses between the two layers of dura mater.

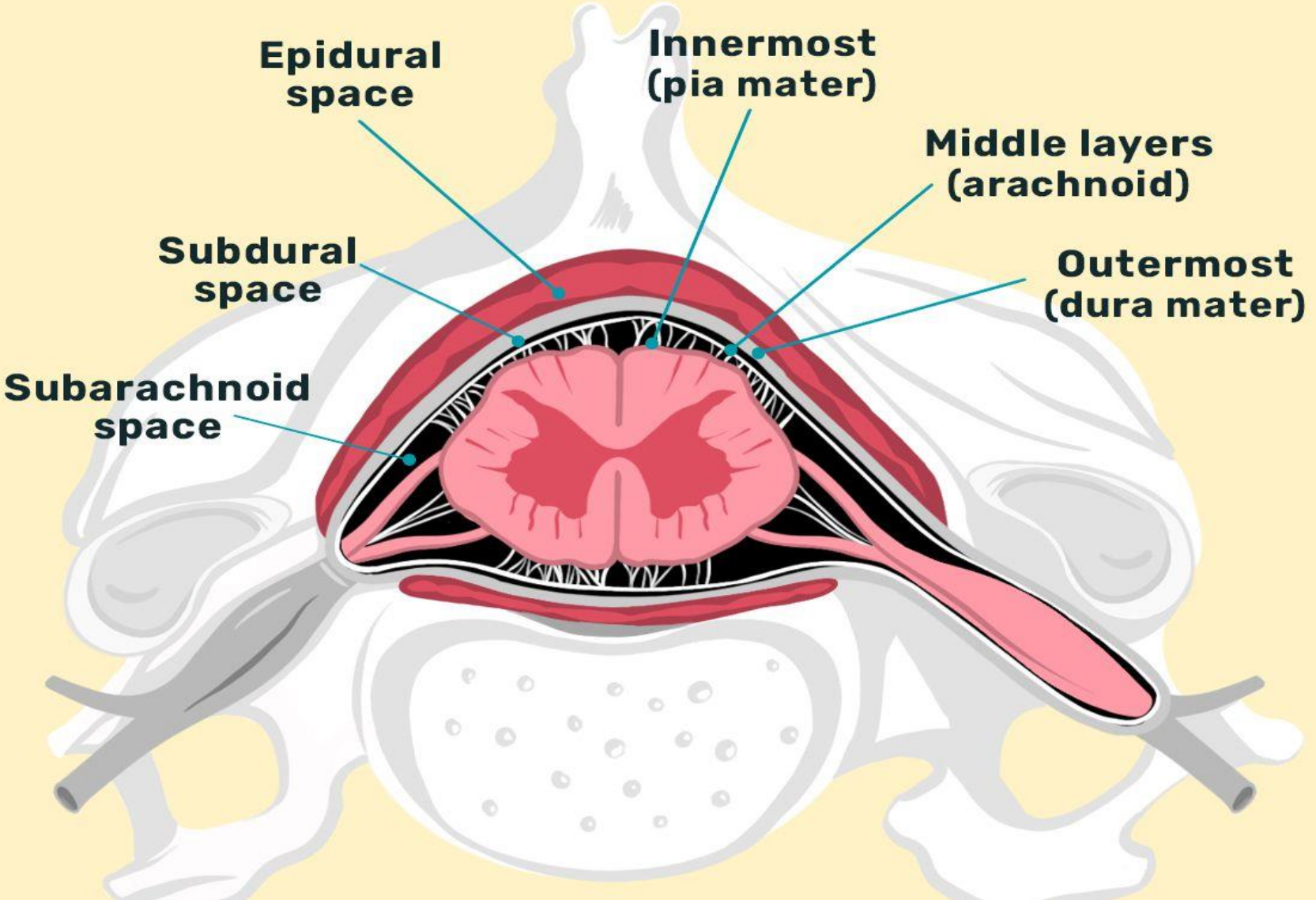
Arachnoid mater

- This is a layer of fibrous tissue that lies between the dura and pia maters.
- It is separated from the dura mater by the subdural space, and from the pia mater by the subarachnoid space, containing cerebrospinal fluid.
- Transfer CSF from ventricles back into the blood stream
- Sub-archnoid space lies b/w archnoid and pia mater , filled with CSF , all blood vessels entering brain as well as cranial nerves pass through this space
- The term arachnoid refers to the spider eweb like appearance of the blood vessels within the space.

Pia Mater

- It adheres to the brain, completely covering the convolutions and dipping into each fissure.
- It continues downwards surrounding the spinal cord.
- It fuses with epEndyma, membrane lining of the ventricles to form structures called ***Choroid Plexus*** which produce CSF

Anatomy of Meninges



Epidural space

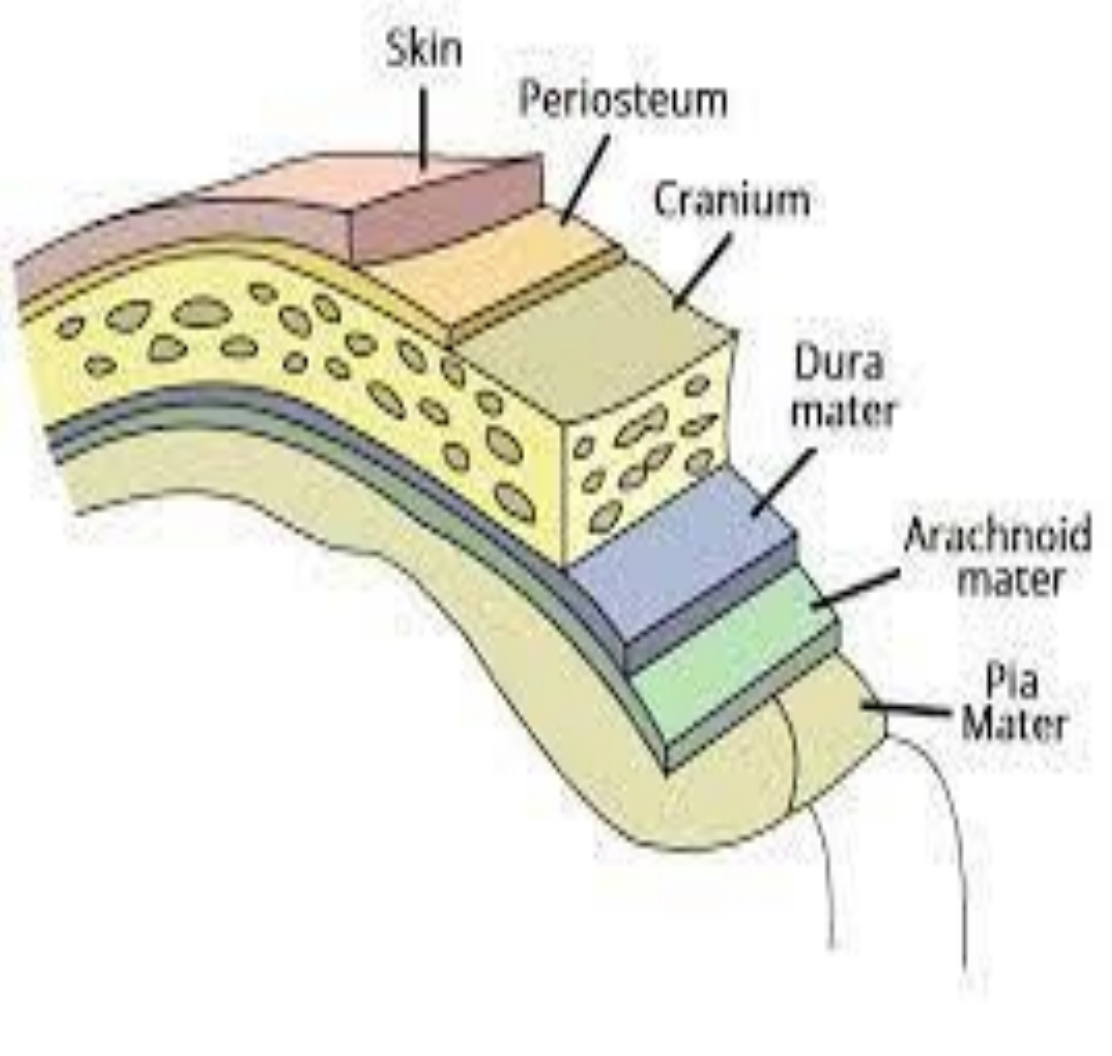
Innermost (pia mater)

Middle layers (arachnoid)

Subdural space

Outermost (dura mater)

Subarachnoid space



The meninges are the membranes covering the brain and spinal cord



Dura mater (2 layers)

Arachnoid

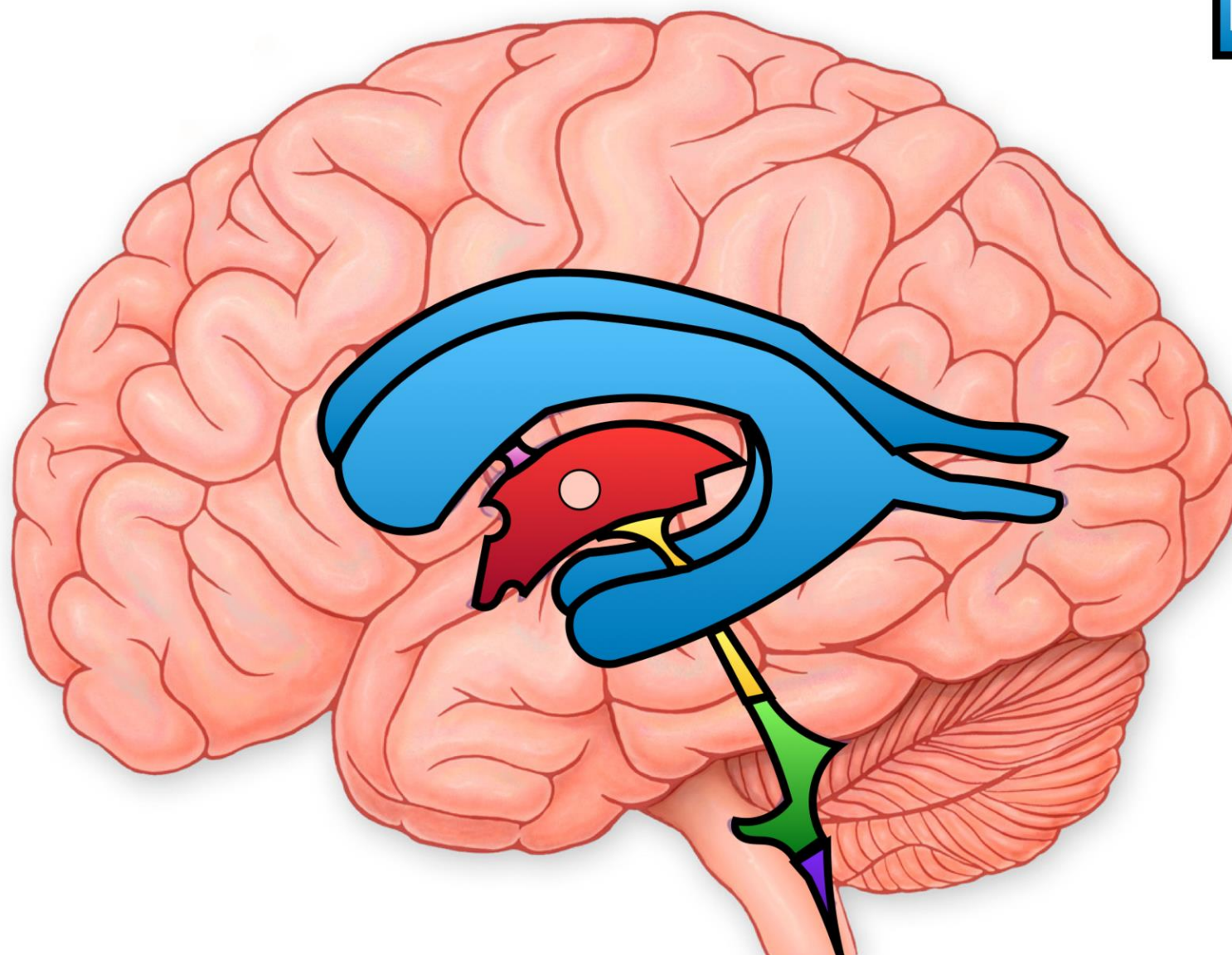
Pia mater



Brain

Ventricles of the brain and the cerebrospinal fluid

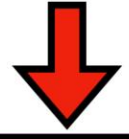
- The brain contains four irregular-shaped cavities, or ventricles, containing cerebrospinal fluid. They are:
 - right and left lateral ventricles
 - third ventricle
 - fourth ventricle.



Lateral Ventricles (2)



Interventricular Foramina (2)



3rd Ventricle



Cerebral Aqueduct

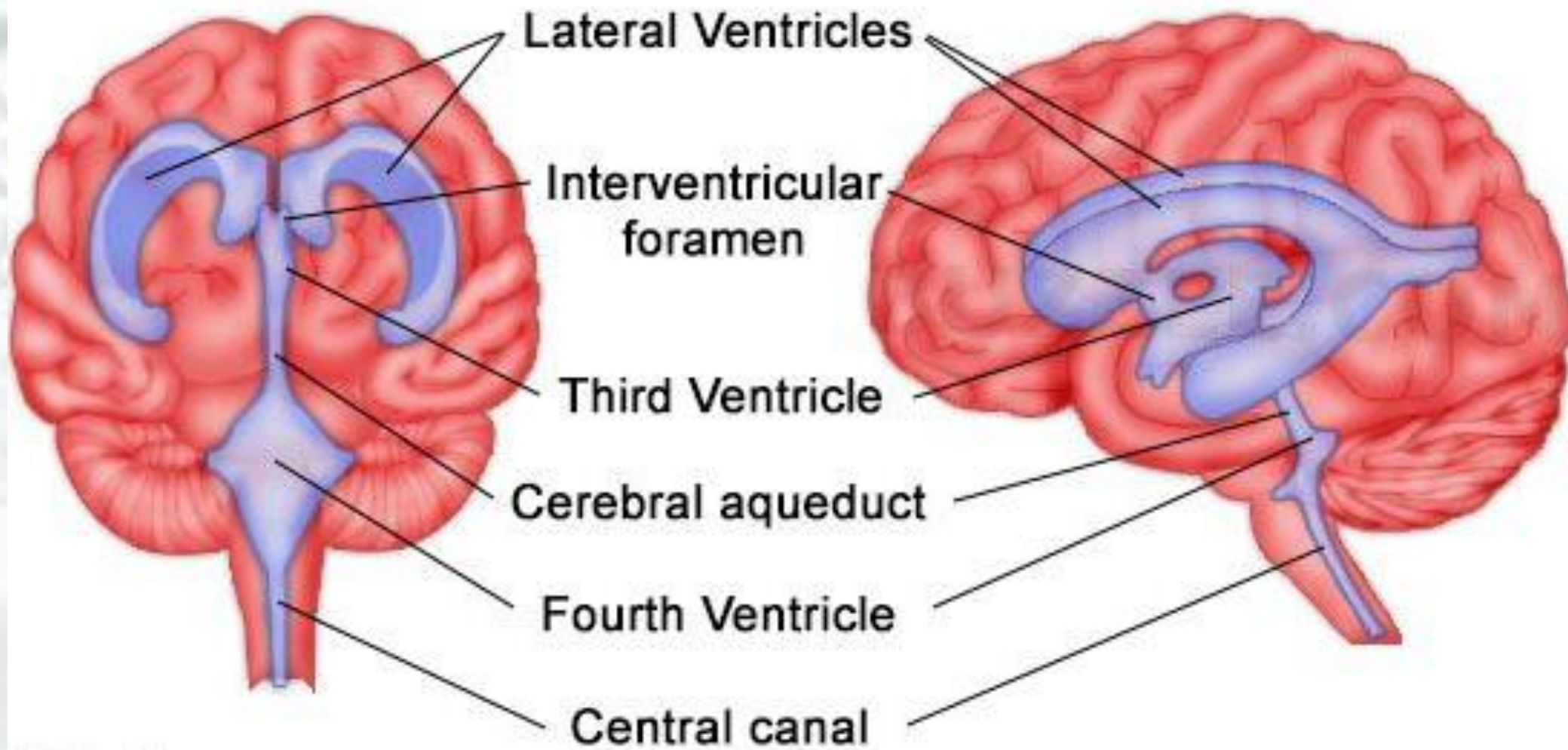


4th Ventricle



Central Canal

Ventricles of the Brain



The lateral ventricles

- lie within the cerebral hemispheres, one on each side of the median plane just below the corpus callosum.
- separated from each other by a thin membrane, the septum lucidum, and are lined with ciliated epithelium.
- They communicate with the third ventricle by interventricular foramina.

The third ventricle

- cavity situated below the lateral ventricles between the two parts of the thalamus.
- communicates with the fourth ventricle by a canal, the cerebral aqueduct.

The fourth ventricle

- A diamond-shaped cavity situated below and behind the third ventricle, between the cerebellum and pons.
- It is continuous below with the central canal of the spinal cord and communicates with the subarachnoid space by foramina in its roof.
- Cerebrospinal fluid enters the subarachnoid space through these openings and through the open distal end of the central canal of the spinal cord.

Cerebrospinal fluid (CSF)

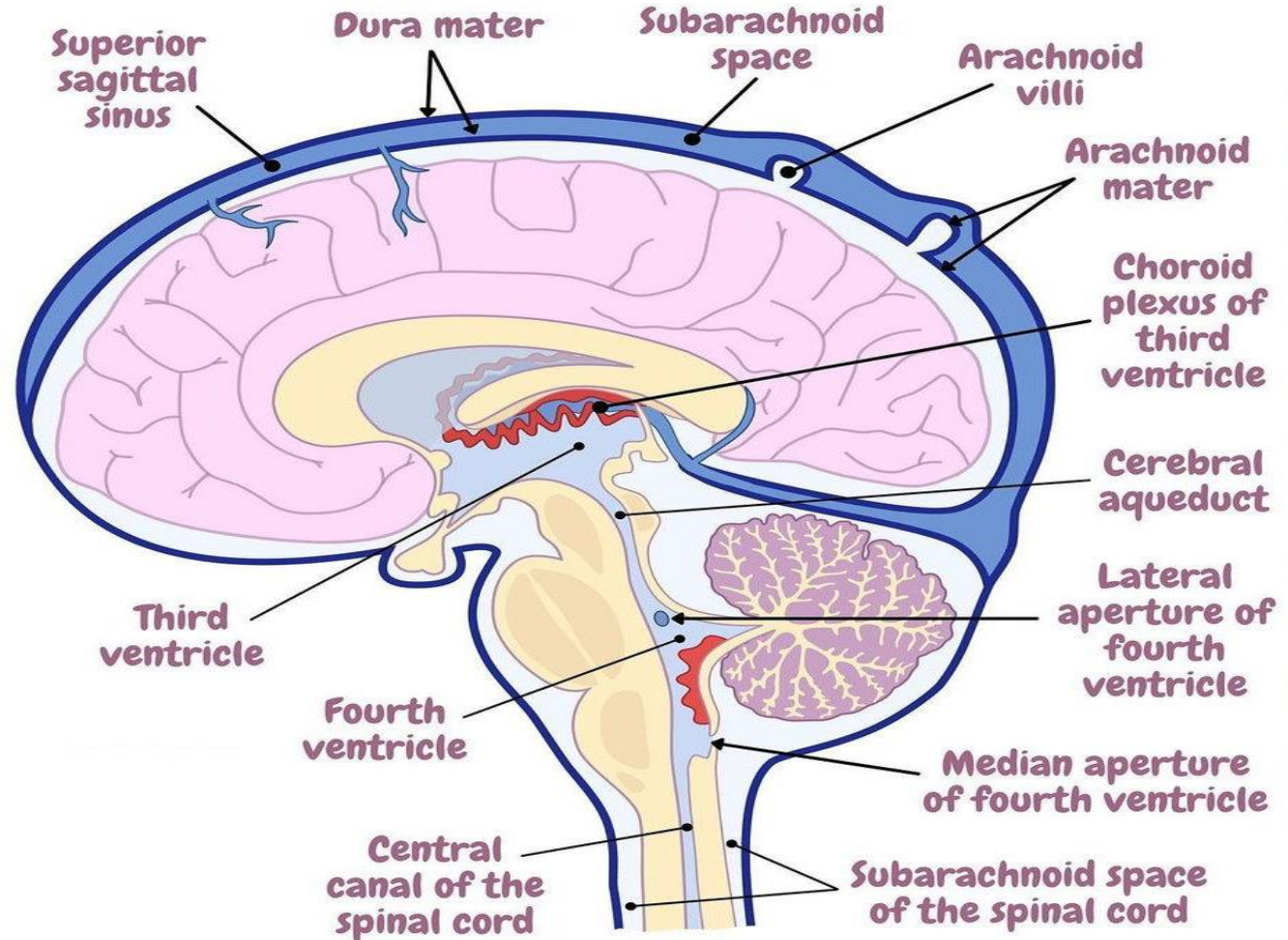
- Clear slightly alkaline fluid with a specific gravity of 1.005, consisting of: water mineral salts glucose plasma proteins: small amounts of albumin and globulin
- Cerebrospinal fluid is secreted into each ventricle of the brain by choroid plexus
- CSF passes back into the blood through tiny diverticula of arachnoid mater, called arachnoid villi
- When CSF pressure is higher than venous pressure, CSF passes into the blood and when the venous pressure is higher the arachnoid villi collapse, preventing the passage of blood constituents into the CSF.
- There may also be some reabsorption of CSF by cells in the walls of the ventricles.

Functions of cerebrospinal fluid

- CSF supports and protects the brain and spinal cord by maintaining a uniform pressure around these vital structures and acting as a cushion or shock absorber between the brain and the skull.
- It keeps the brain and spinal cord moist and there may be exchange of nutrients and waste products between CSF and nerve cells.
- CSF is thought to be involved in regulation of breathing as it bathes the surface of the medulla where the central respiratory chemoreceptors are located.

Ventricular System - Pathway of CSF flow

- 1 CSF is produced and secreted by the choroid plexus of each lateral ventricle
- 2 CSF flows through interventricular foramina into the third ventricle
- 3 Choroid plexus of the third ventricle adds more CSF
- 4 CSF flows down cerebral aqueduct into the fourth ventricle
- 5 Choroid plexus of the fourth ventricle adds more CSF
- 6 CSF flows out the two lateral apertures and one median aperture
- 7 CSF fills the subarachnoid space and bathes the external brain & spinal cord
- 8 At the arachnoid villi, CSF is reabsorbed into the venous blood of the dural venous sinuses



“Liquid Inside The Cerebrum Flows Around Subarachnoid Space”

Liquid = **L**ateral Ventricles

Inside = **I**nterventricular Foramina (Monro)

The = **T**hird Ventricle

Cerebrum = **C**erebral Aqueduct (Sylvian)

Flow = **F**ourth Ventricle

Around = **A**pertures

Subarachnoid = **S**ubarachnoid Space

Space = **S**inuses (Dural Venous)



THANK YOU