



Nervous System

THE BRAIN

Reading: Chapter
9

1. Basic Structure

Gray matter = nerve cell bodies

White matter = myelinated axons

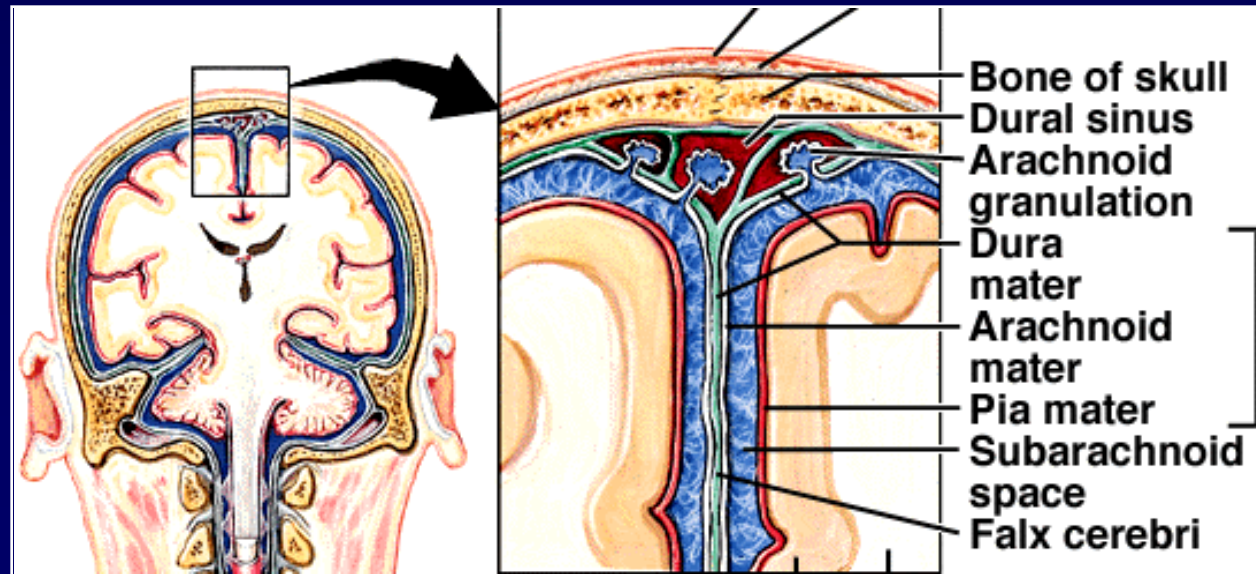
Ganglion = -a bundle of cell bodies (usually out of CNS)

Ex:

- dorsal root ganglion
- autonomic ganglia
- basal ganglia (in the brain)

2) Meninges -the same 3 layers protect the brain & cord

- a) dura mater -tough outer layer
-2 layers in brain
*periosteal layer = inner periosteum of skull bones
*inside layer = meningeal layer
-layers are fused in many areas
-separations = dural sinuses, drain to v. blood
- b) arachnoid mater -middle layer
- c) pia mater -inner layer, forms choroid plexuses (CSF formation)

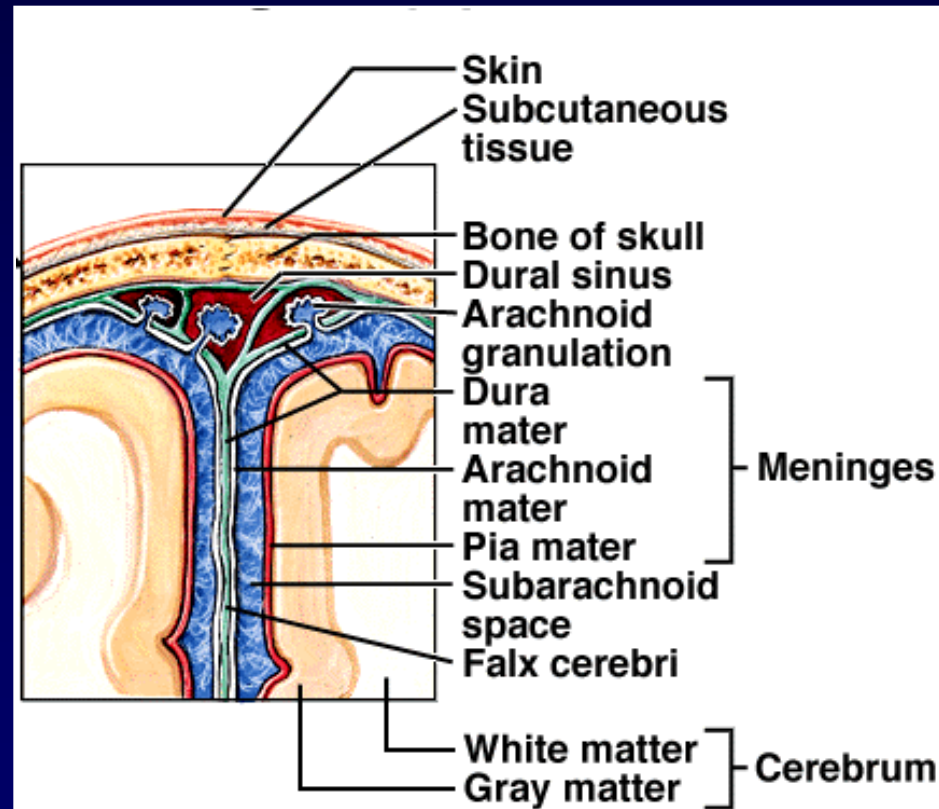


2) Meninges

- d) subarachnoid space
 - filled w/ CSF (blue here)
 - b/w arachnoid and pia layers
 - CSF cushions & supports brain

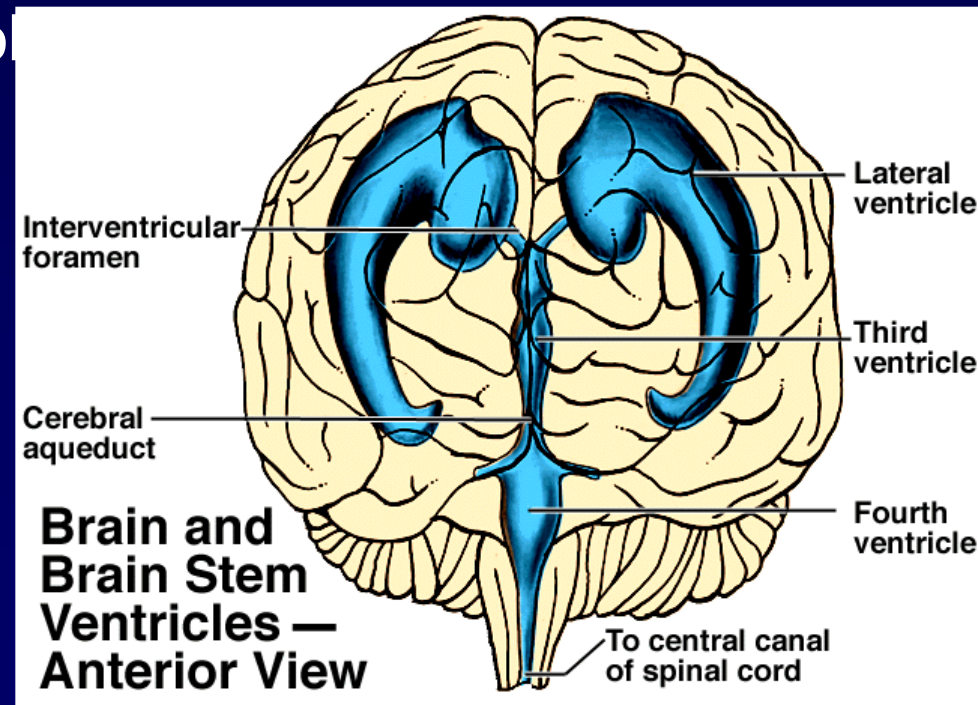
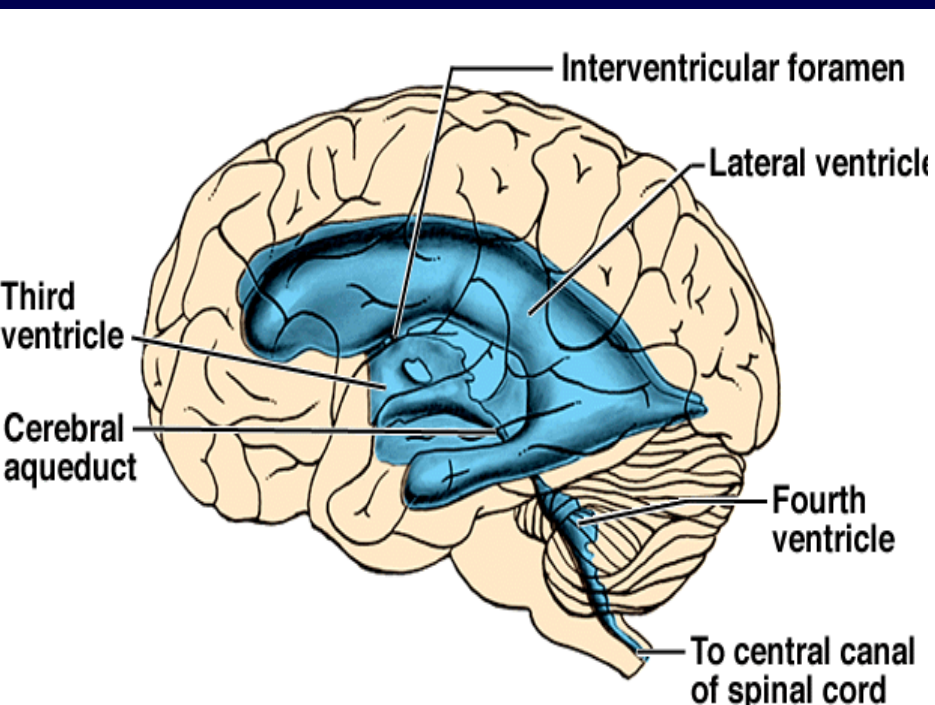
Meningitis

- inflammation of meninges
- usually affects arachnoid & pia layers
- bacterial or viral
- symptoms include: fever, headache
- complication: sensory impairment, paralysis, mental retardation, coma, death



3) Ventricles - 4 fluid filled spaces in the brain

- a) lateral ventricles -2 large spaces in cerebrum
-2 in each hemisphere
- b) 3rd ventricle -by thalamus & hypothalamus
- c) cerebral aqueduct



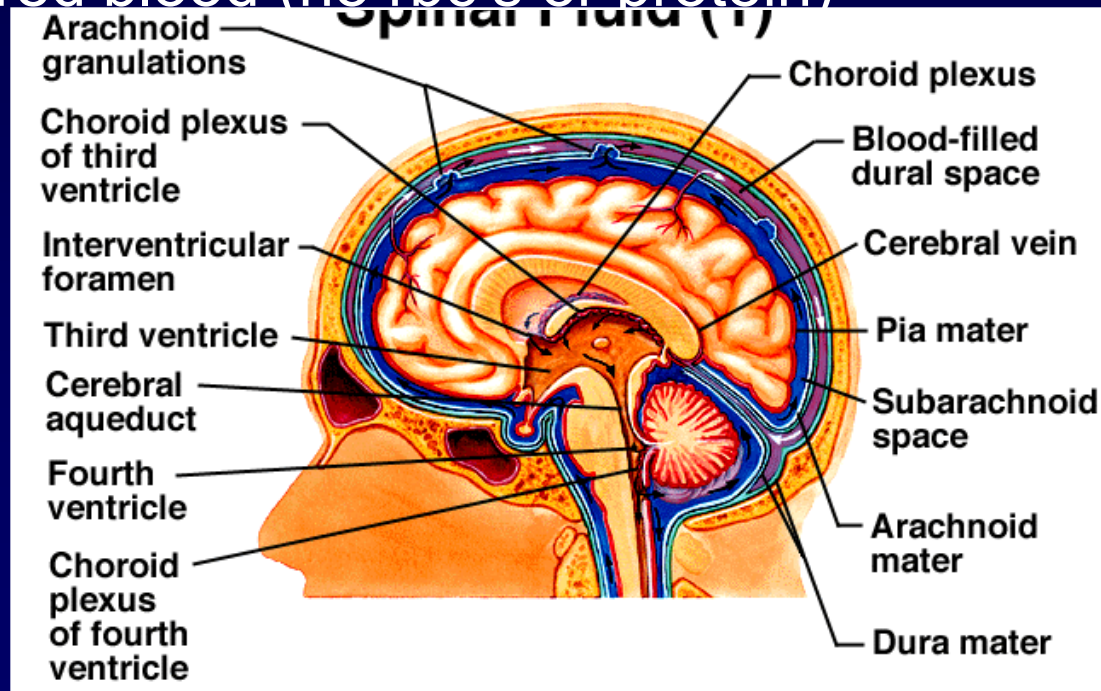
e) choroid plexuses -network of modified blood vessels, pia mater

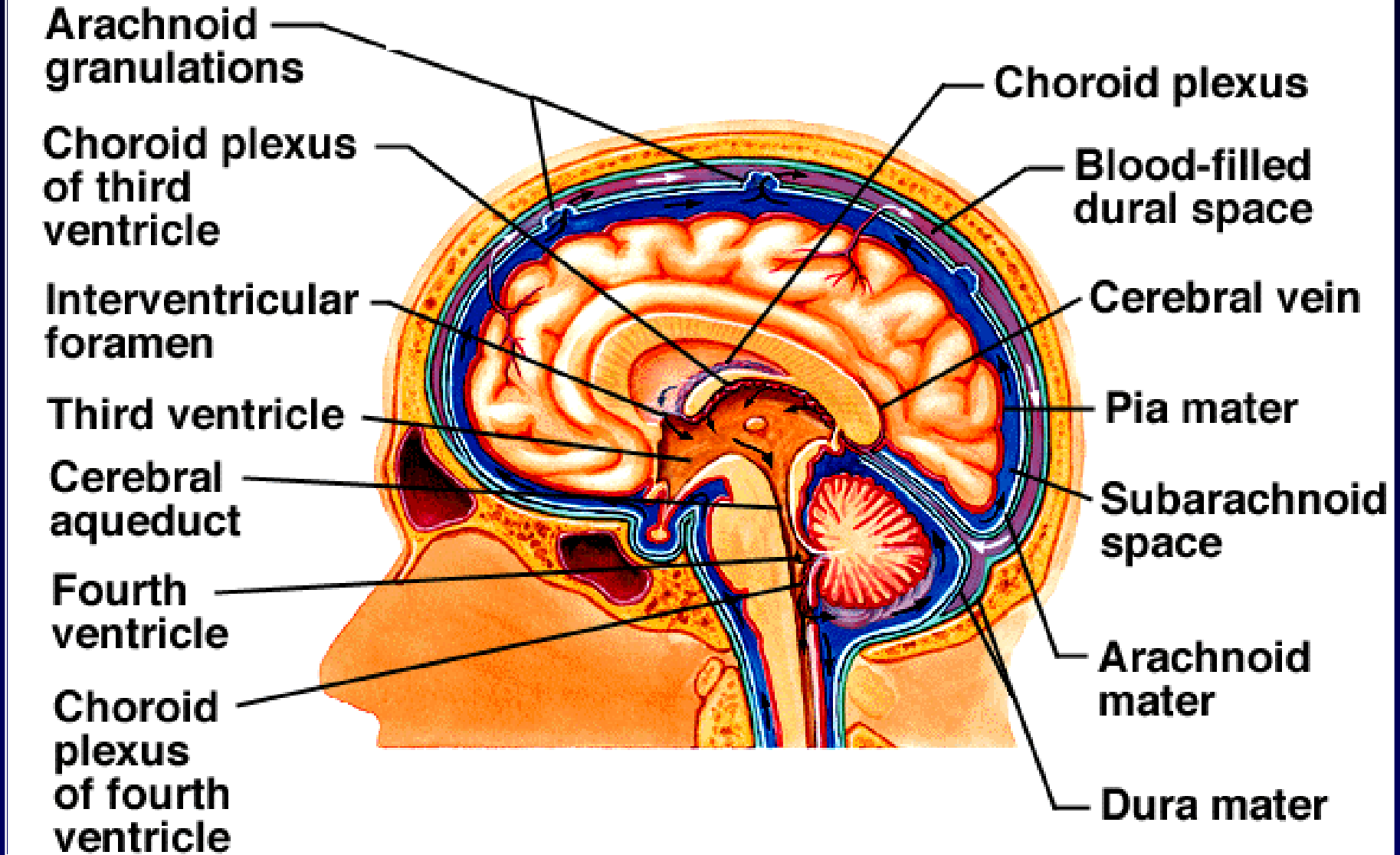
-produces CSF

-found in all 4 ventricles

f) CSF -produced at a rate ~ 1/3 of urine

-filtered blood (no rbc's or protein)





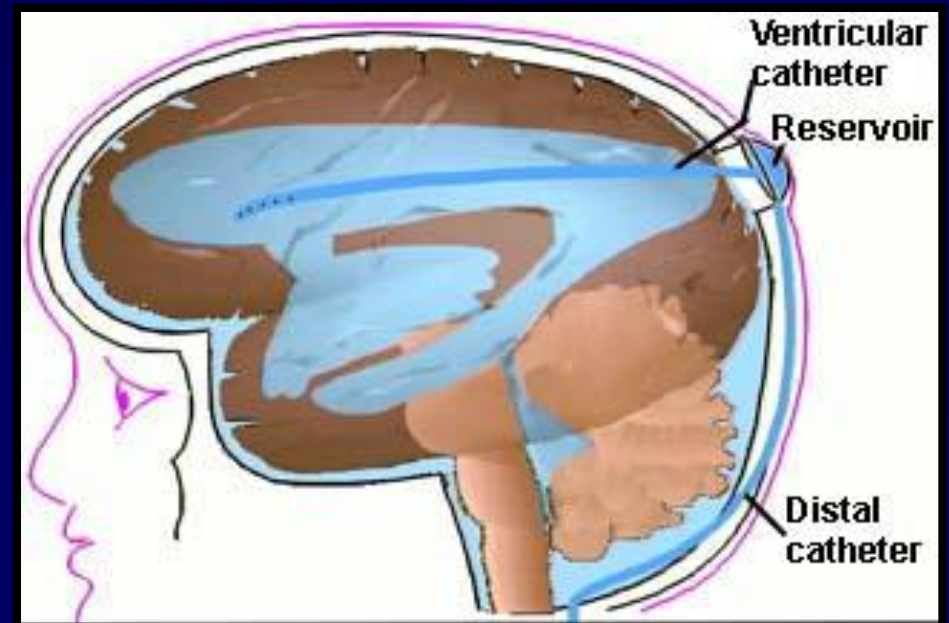
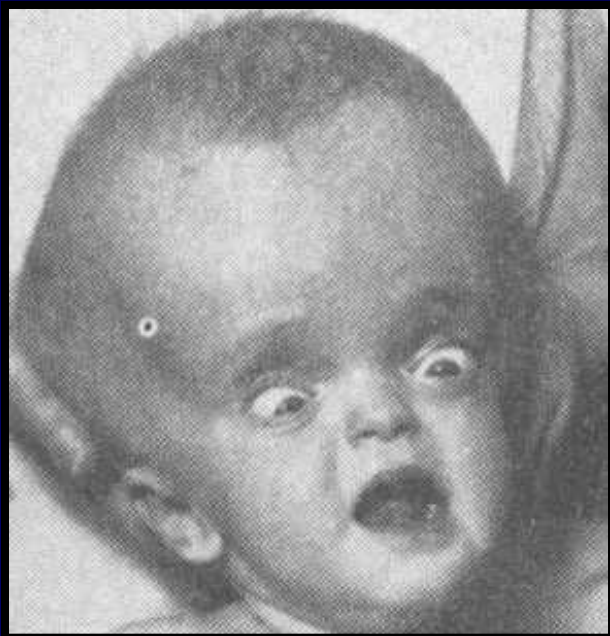
CSF made by _____ plexus (in all 4 ventricles)

lateral ventricles → 3rd → cerebral aqueduct → 4th → central canal

subarachnoid space → arachnoid villi → venous blood via dural

What are 3 reasons CSF is important?

- g) Hydrocephalus -impaired circulation of the CSF
-ventricles expand
-causes the brain and head to enlarge
-treated with a shunt to lateral ventricle



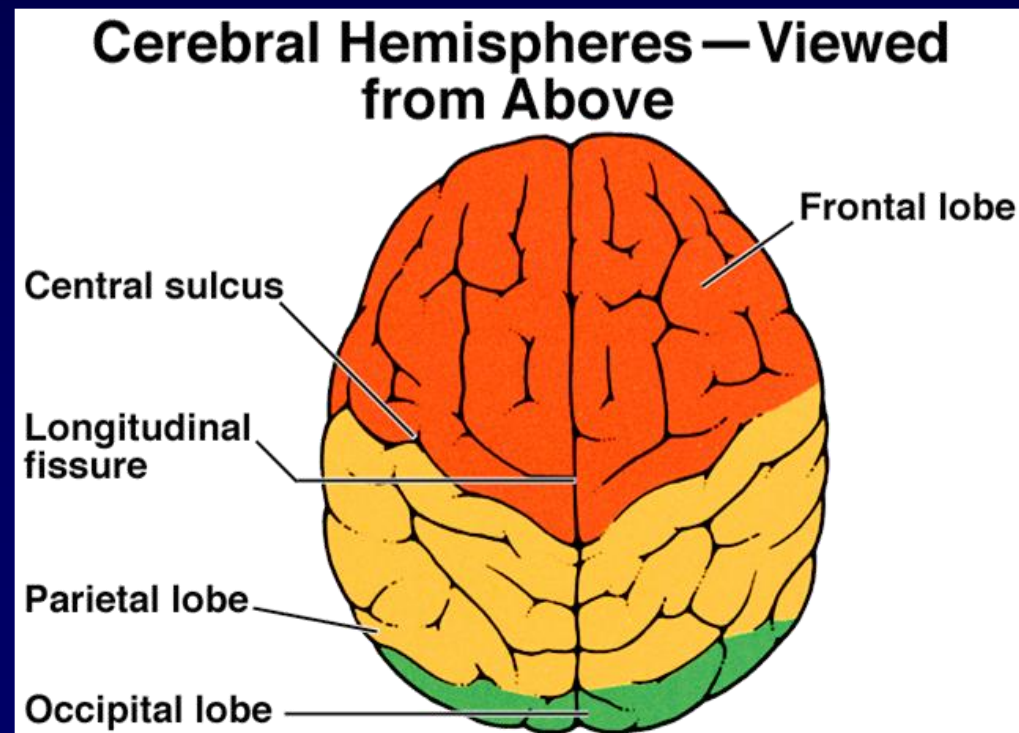
4) Cerebrum

- the largest part of the brain
- divided into 2 hemispheres
- sensory, motor & higher mental function

a) sulci (singular sulcus) -small valleys

b) gyri (singular gyrus) –ridges

c) fissure –a very deep sulcus



d) longitudinal fissure -divides brain in half

e) fissures divide cerebrum into lobes, named by cranial bones:

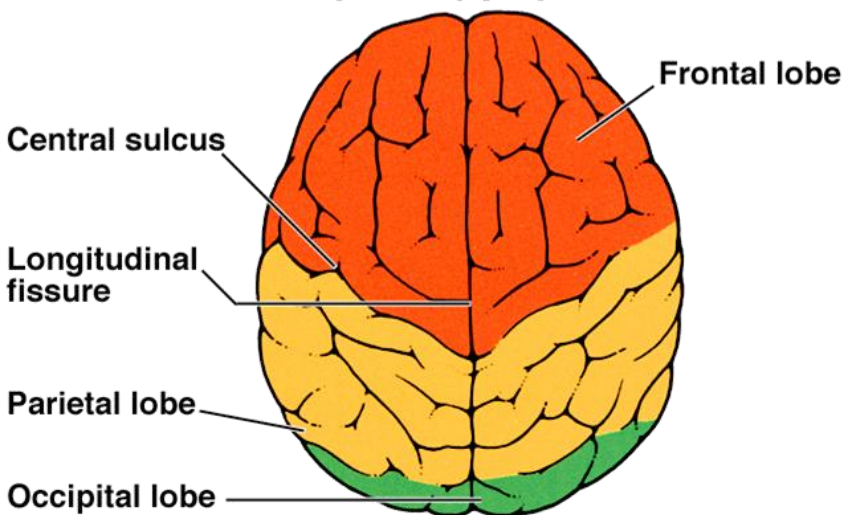
1) **frontal** – motor areas (control of skeletal muscles, incl. speech),

personality, problem solving...

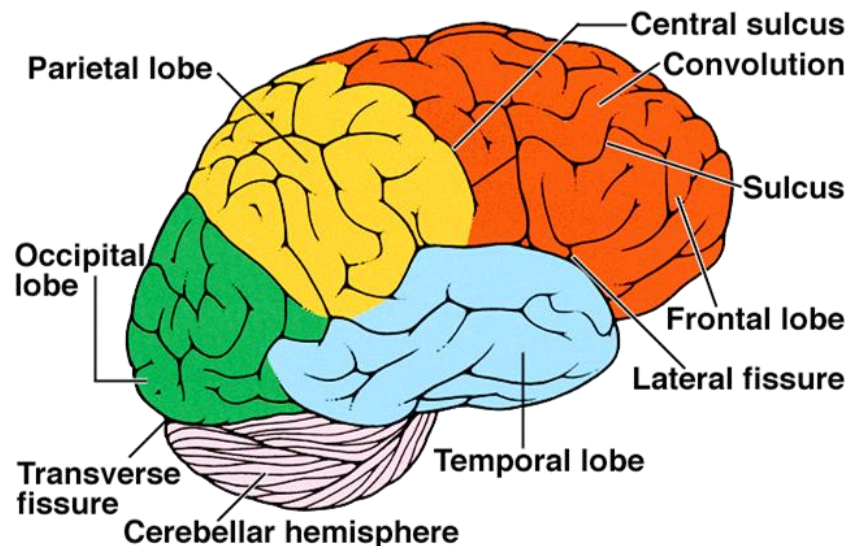
2) **parietal** – sensations (skin - touch, temp., pressure, pain)
speech (understanding & using speech for expression)

3) **temporal** - hearing

Cerebral Hemispheres — Viewed from Above



Cerebral Hemisphere — Lateral View

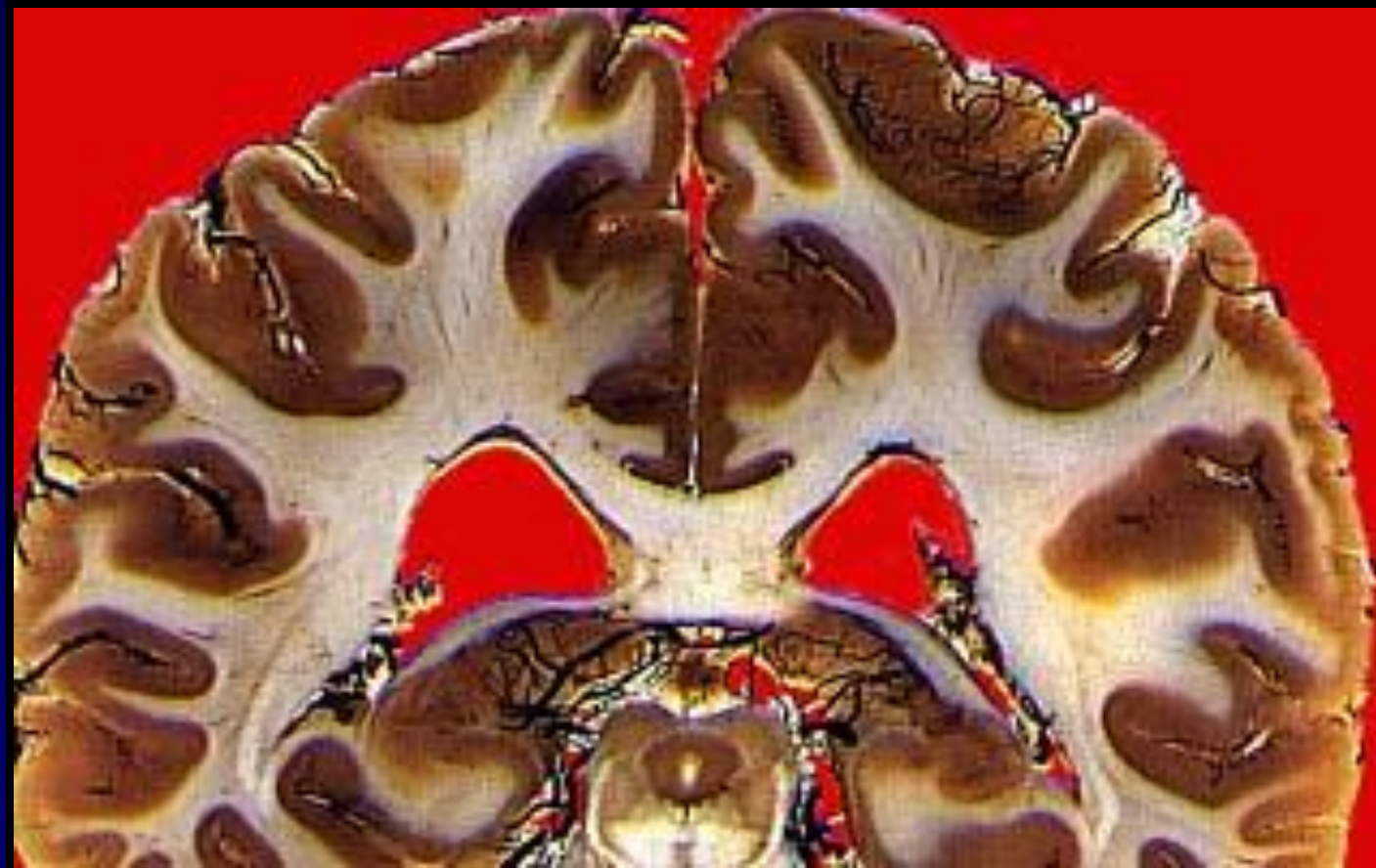


f) cerebral cortex
matter”

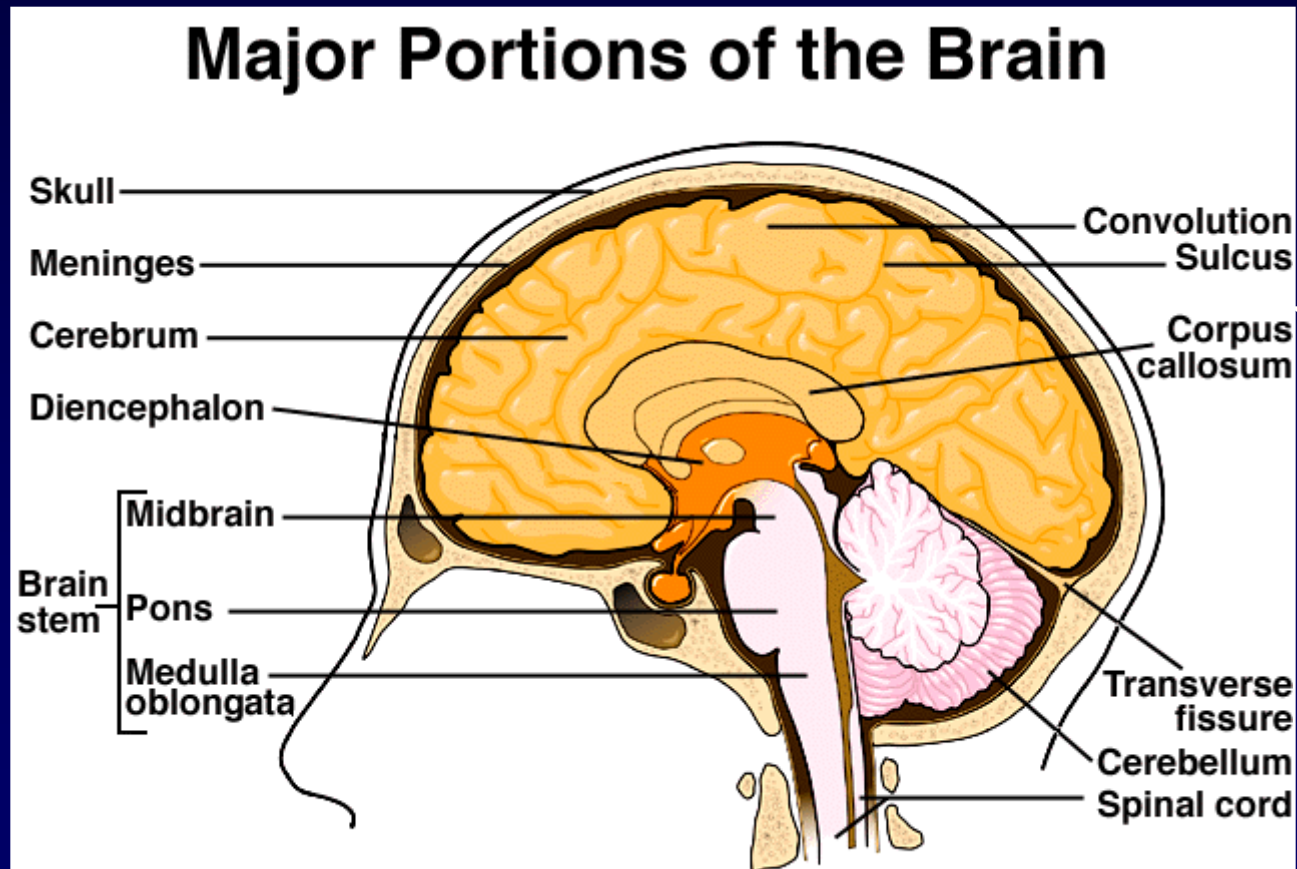
-thin layer of nerve cell bodies, “gray

-75% of all CNS cell bodies

-control center, thinking, feeling,
personality



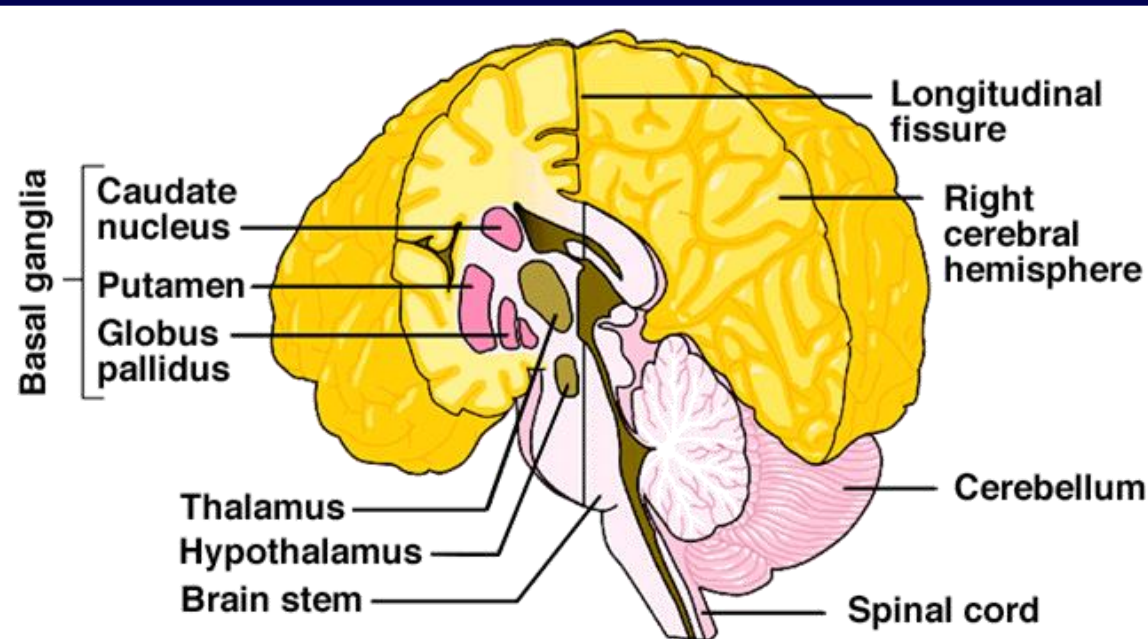
- g) corpus callosum -white matter
-communication b/w the 2
hemispheres



h) basal ganglia - gray matter deep w/in white matter
- a.k.a cerebral nuclei
- control slow, smooth movements
(walking)

*low dopamine (inhibitory NT) = overactive ganglia = tremors
(Parkinson's)

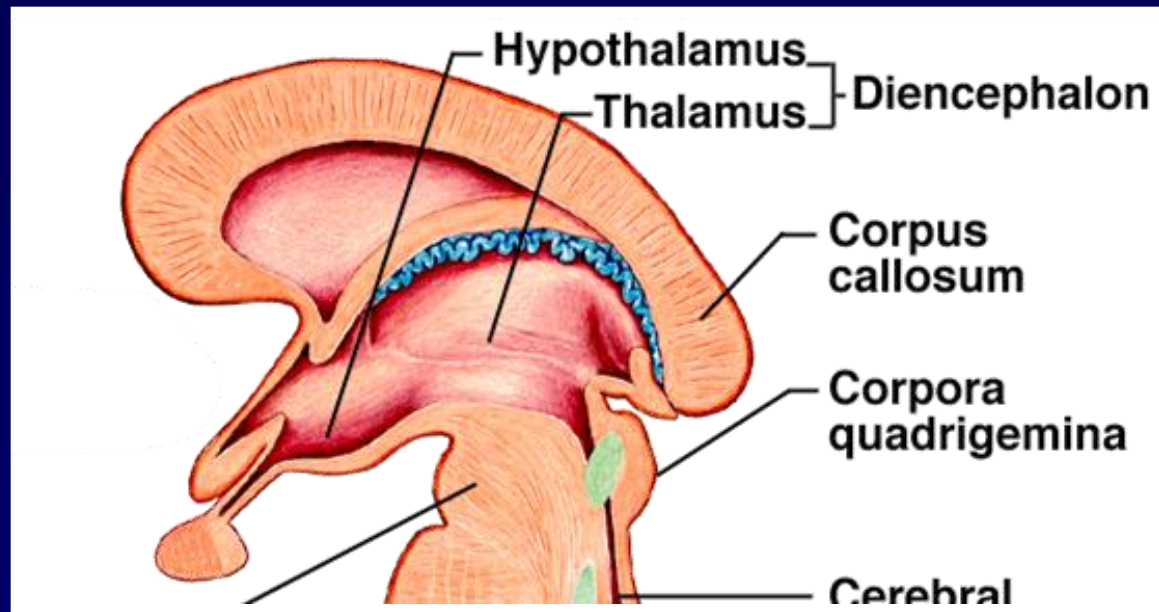
*deterioration of basal ganglia
(Huntington's)



5) **Diencenphalon** (surrounded by 3rd ventricle)

-thalamus

-hypothalamus



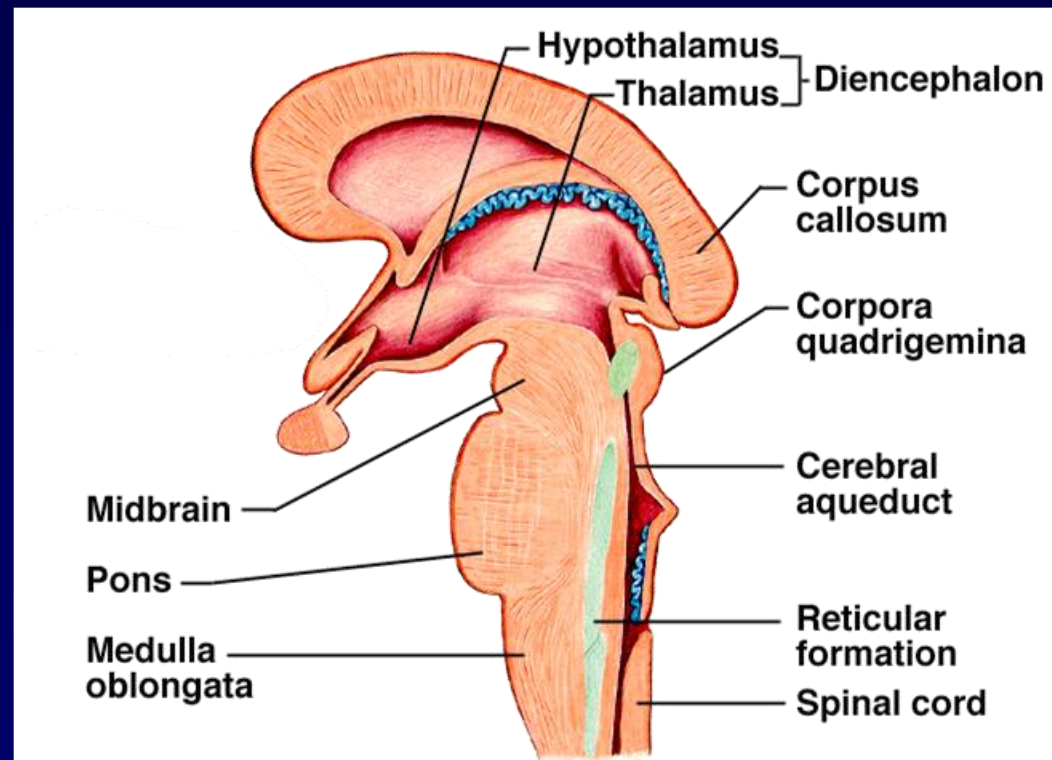
5) Diencenphalon

5a) Thalamus -below corpus callosum

- a) sensory synapse area, relay to parietal lobes
-general sensory awareness
- b) part of limbic system (emotions)

Why are emotions important?

Limbic system:
thalamus, hypothalamus,
frontal and temporal lobes,
And basal ganglia



5b) Hypothalamus


“less than”

-below thalamus

-part of the limbic system

-center of homeostasis

Important for:

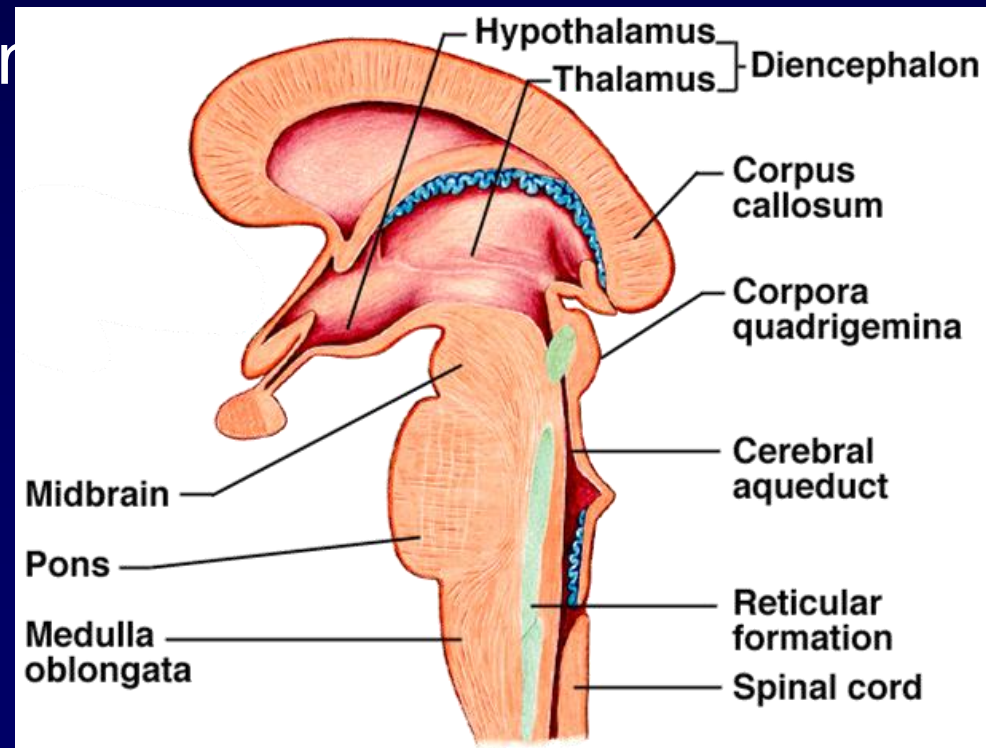
- a) appetite, body weight, movement/secretion of GI
- b) thirst, electrolyte balance
- c) body temperature
- d) heart rate & blood pressure
- e) sleep patterns (with pineal gland and melatonin)

6) Brain Stem (midbrain, pons, medulla)

6a) **midbrain** -auditory and visual tracking

6b) **Pons** -“bridge” b/w brain and spinal cord

-respiratory center
(breathing)



6c) Medulla oblongata

-just above spinal cord

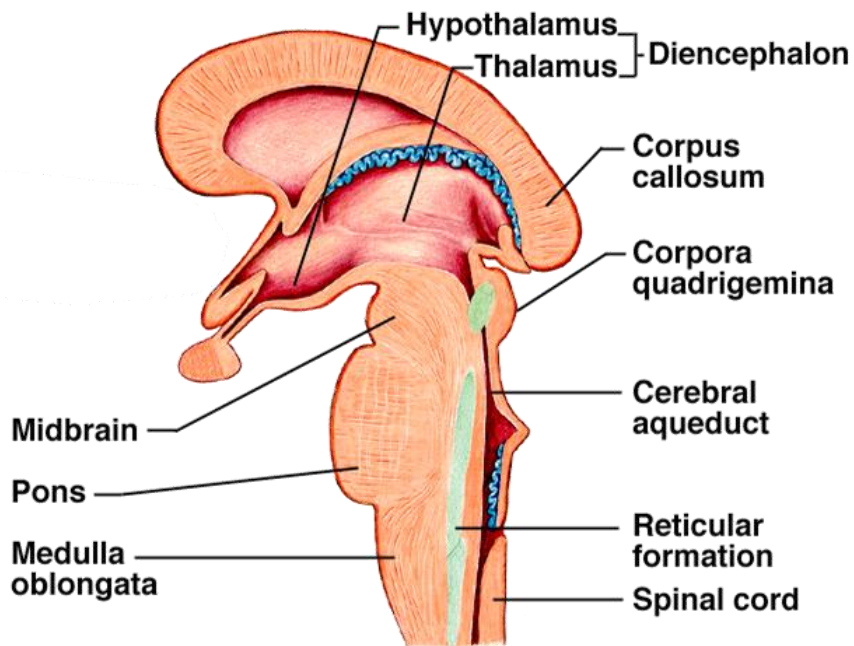
-reflex area of brain

Controls: a) Respiration: rate & rhythm

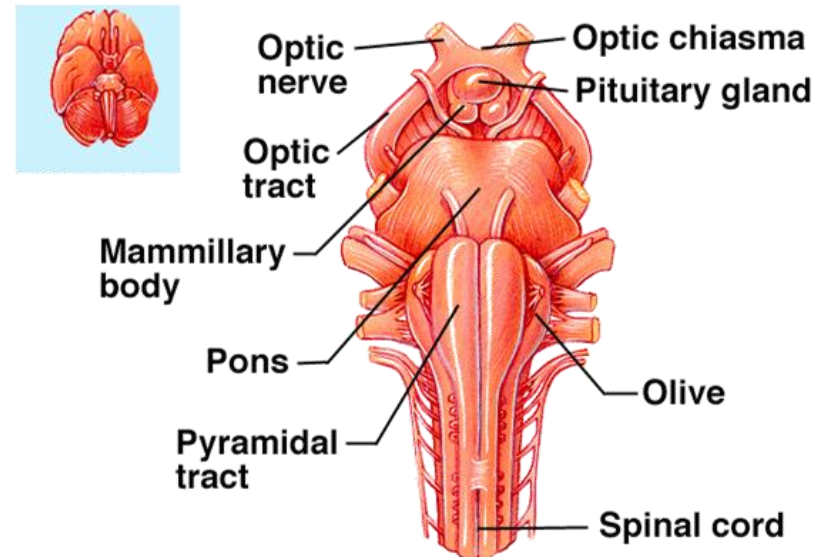
b) vasomotor control: BP, vessel size

c) cardiac center: HR

d) others: swallowing, coughing, sneezing...



Brain Stem — Ventral View



6) Brain Stem

6d) reticular formation

diencephalon

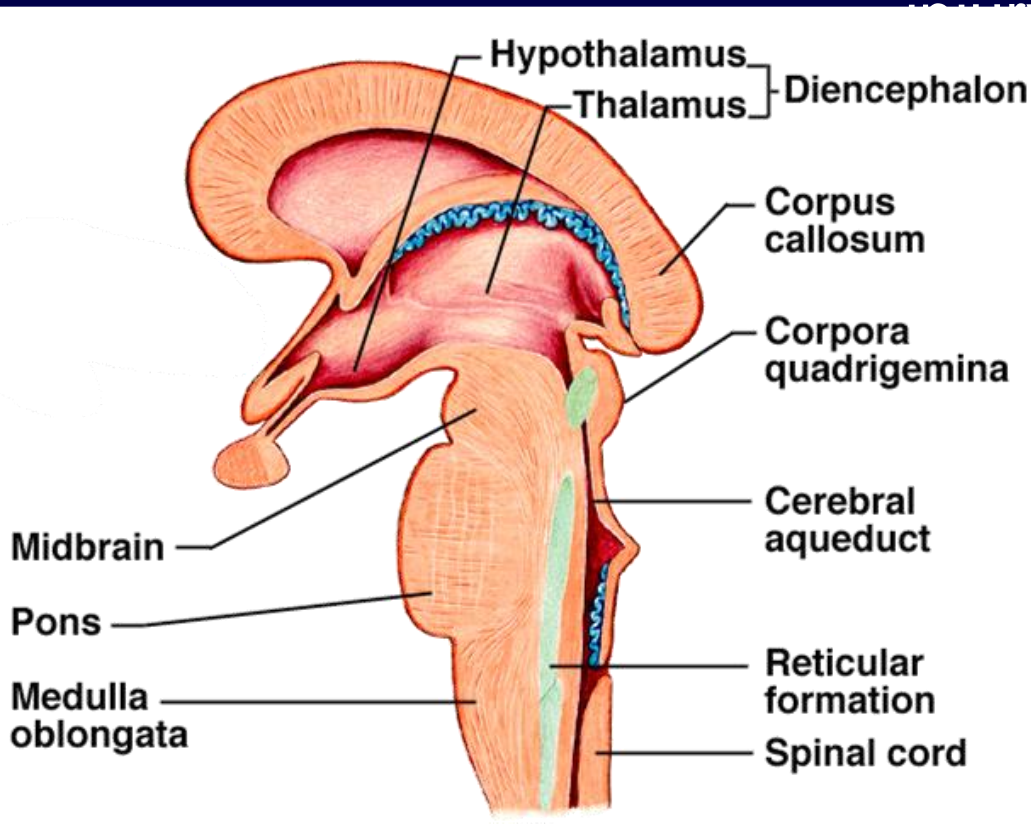
increased activity = awake

-neurons going to

-

-decreased activity = sleep

-injury = comatose state (no



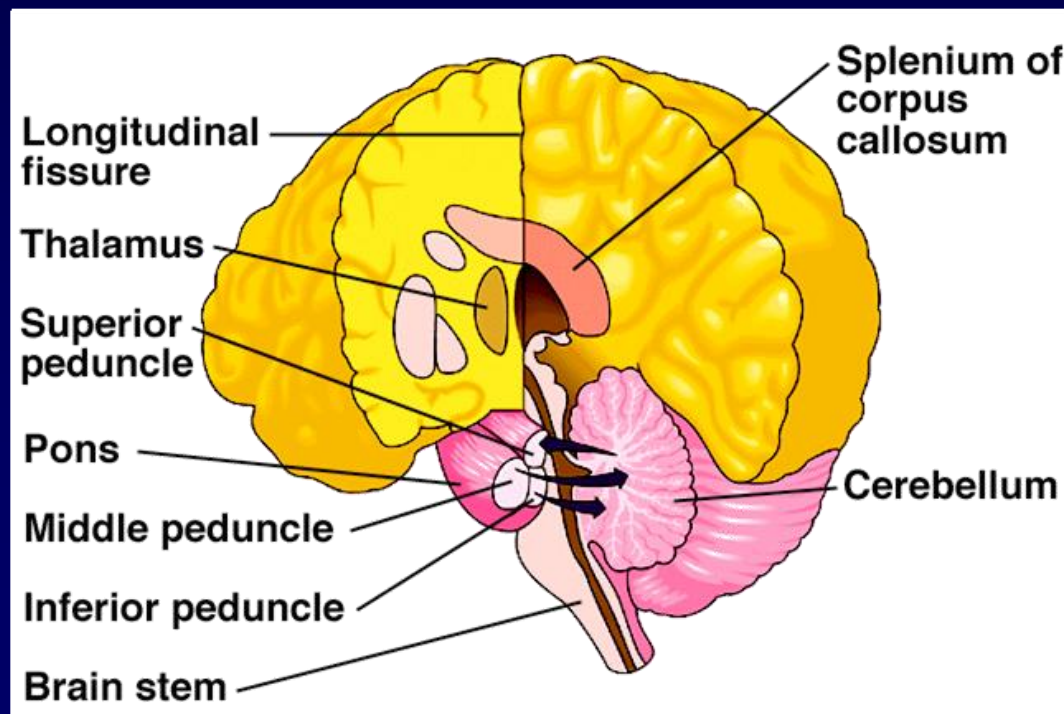
7) Cerebellum -the 2nd largest area of the brain

-below occipital lobe

-arbor vitae = has motor neurons

a) subconscious motor control

b) controls posture and balance



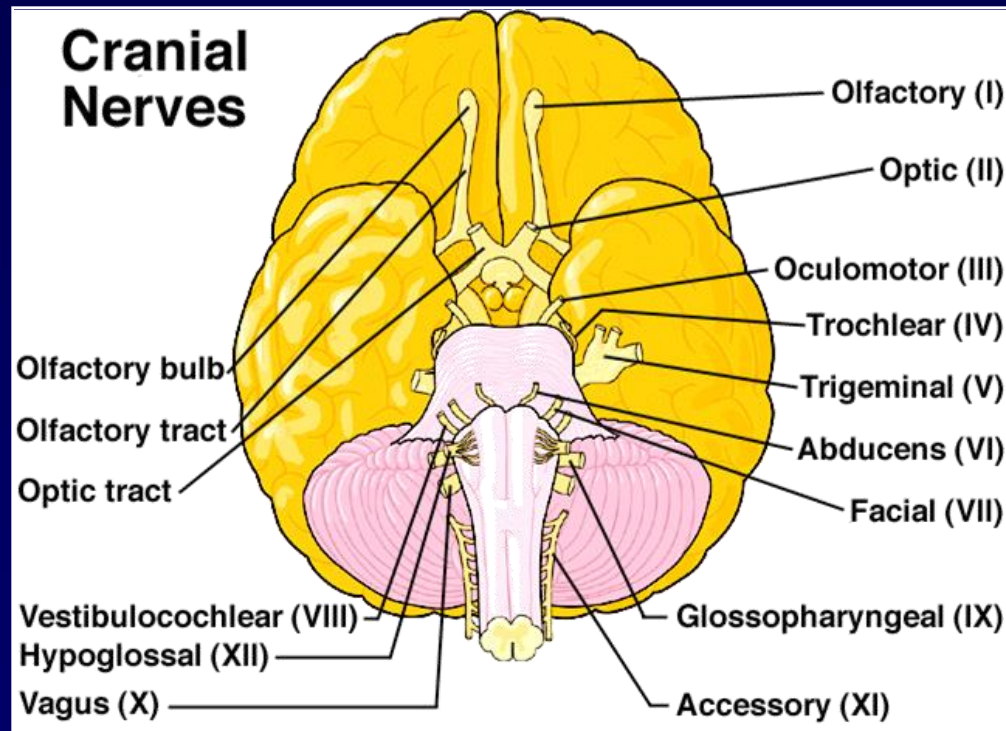
8) Cranial nerves -12 nerves on inferior surface of brain

-PNS

-named by function

-and by roman numeral (front to back)

Table 9.5



Cranial Nerve “Trick”

On	Olfactory
Occasion	Optic
Our	Oculomotor
Trusty	Trochlear
Truck	Trigeminal
Acts	Abducens
Funny	Facial
Very	Vestibulocochlear
Good	Glossopharyngeal
Vehicle	Vagus
Any	Accessory
How	Hypoglossal