Review

Central nervous system (CNS) ?

brain and spinal cord

Peripheral nervous system (PNS) ?

Nerves in the extremities that carry sensations from sensory receptors in the skin & joints to the spinal cord and nerves that carry signals from the spinal cord to motor units of muscles; cranial nerves

Autonomic nervous system ?

Controls viscera, glands, smooth muscles

The Nervous System has **FOUR FUNCTIONS** that enable the body to respond quickly?

A. **Gathers information** both from the outside world and from inside the body. **SENSORY FUNCTION**

B. **Transmits the information** to the processing area of the brain and spinal cord.

C. **Processes the information** to determine the best response. **INTEGRATIVE FUNCTION**

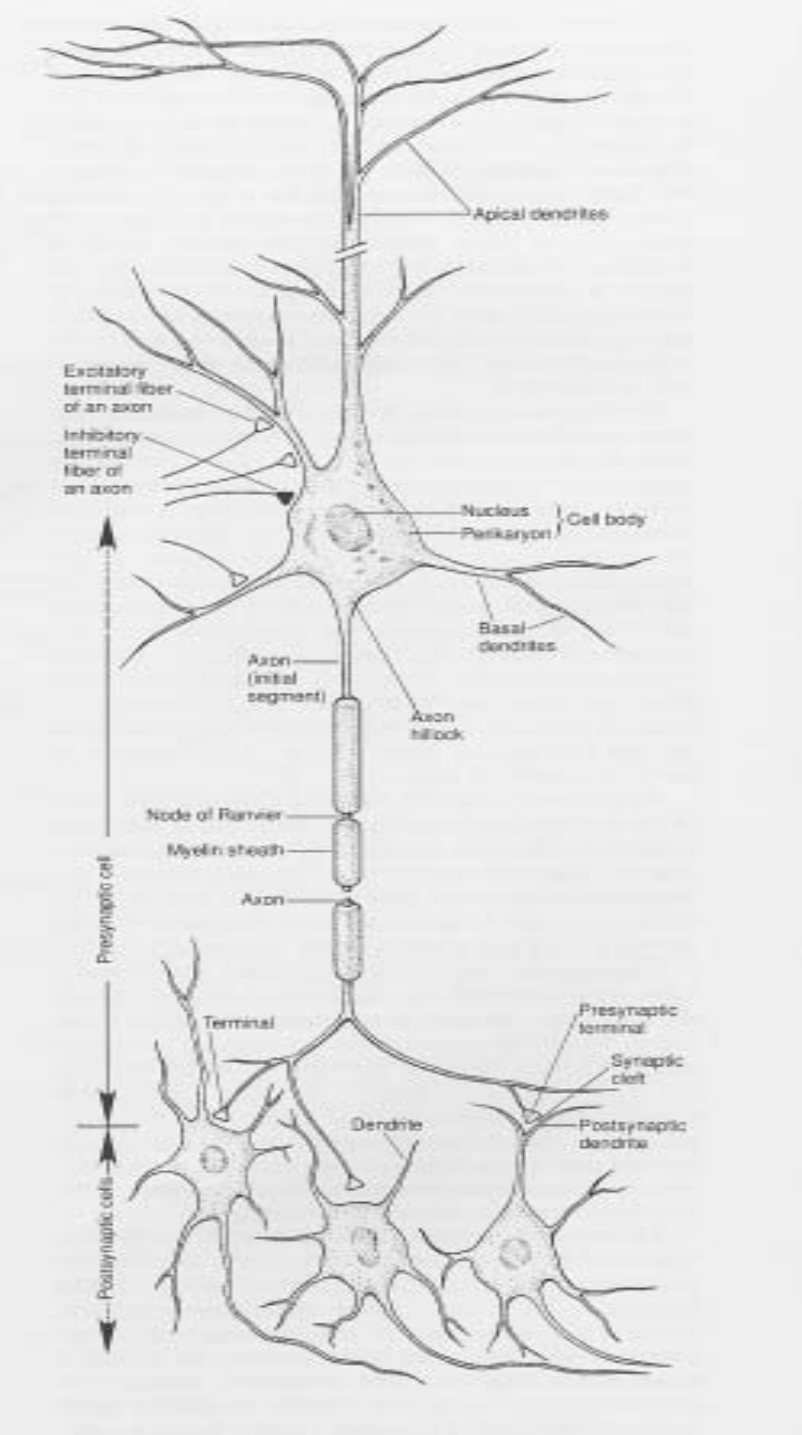
D. **Sends information to muscles, glands, and organs (effectors) so they can respond correctly.** Muscular contraction or glandular secretions. **MOTOR FUNCTION**

When a reflex arc consists of only two neurons (one sensory neuron and one motor neuron), it is defined as?

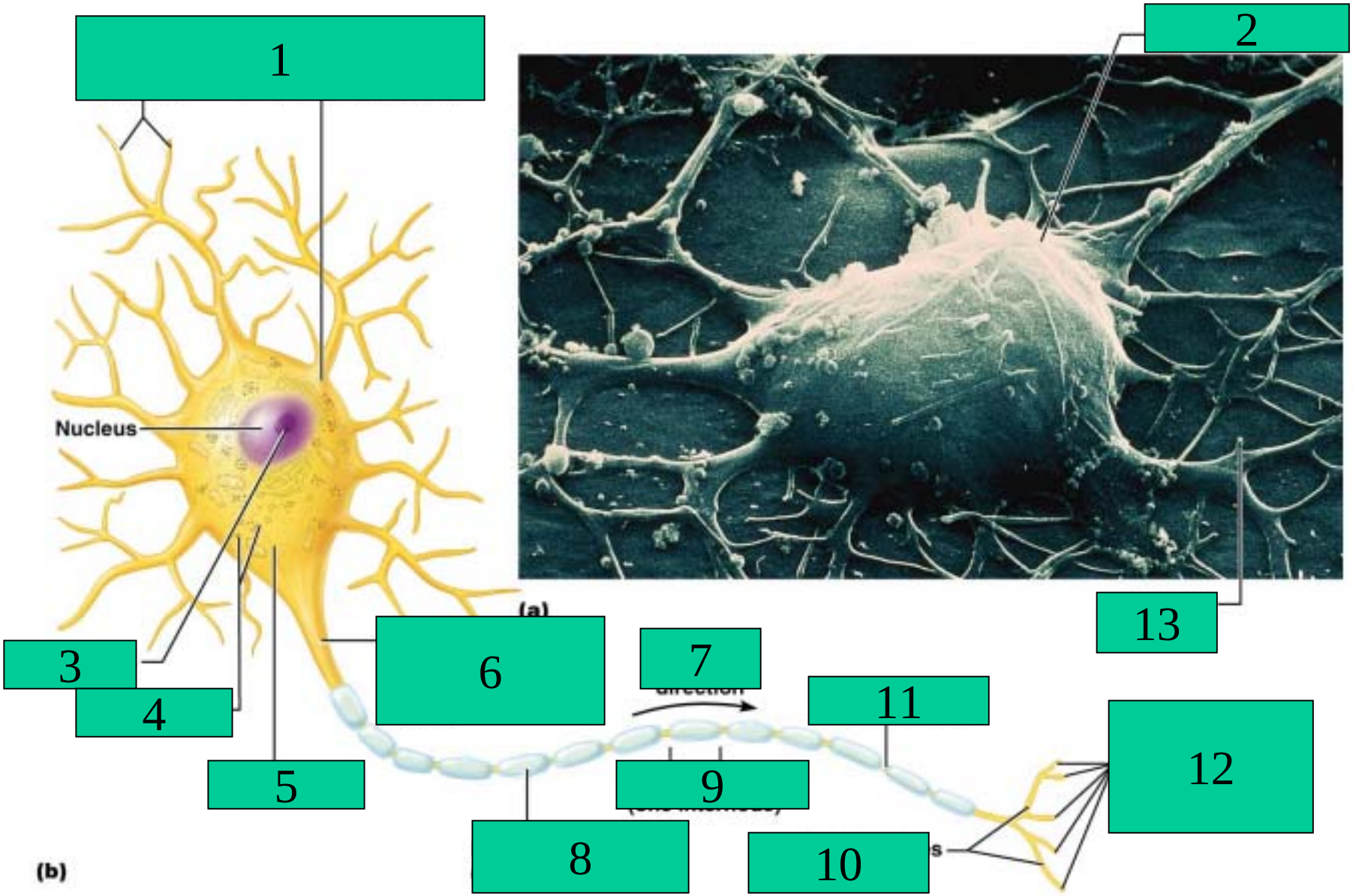
Monosynaptic .

one or more interneurons connect afferent (sensory) and efferent (motor) signals.?

polysynaptic reflex pathways



Anatomy of the neuron


1
2
Nucleus
(a)
13
3
4
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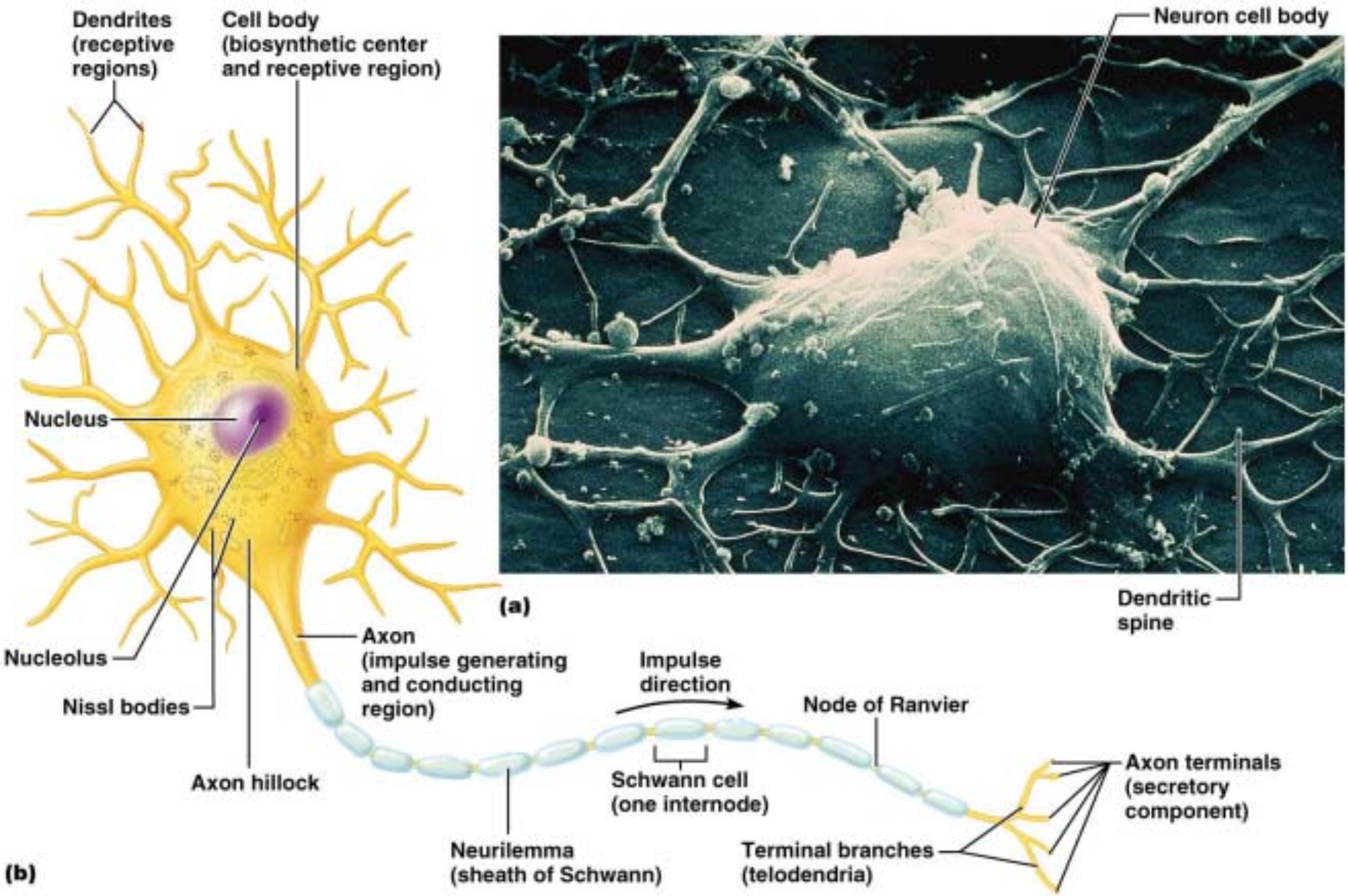
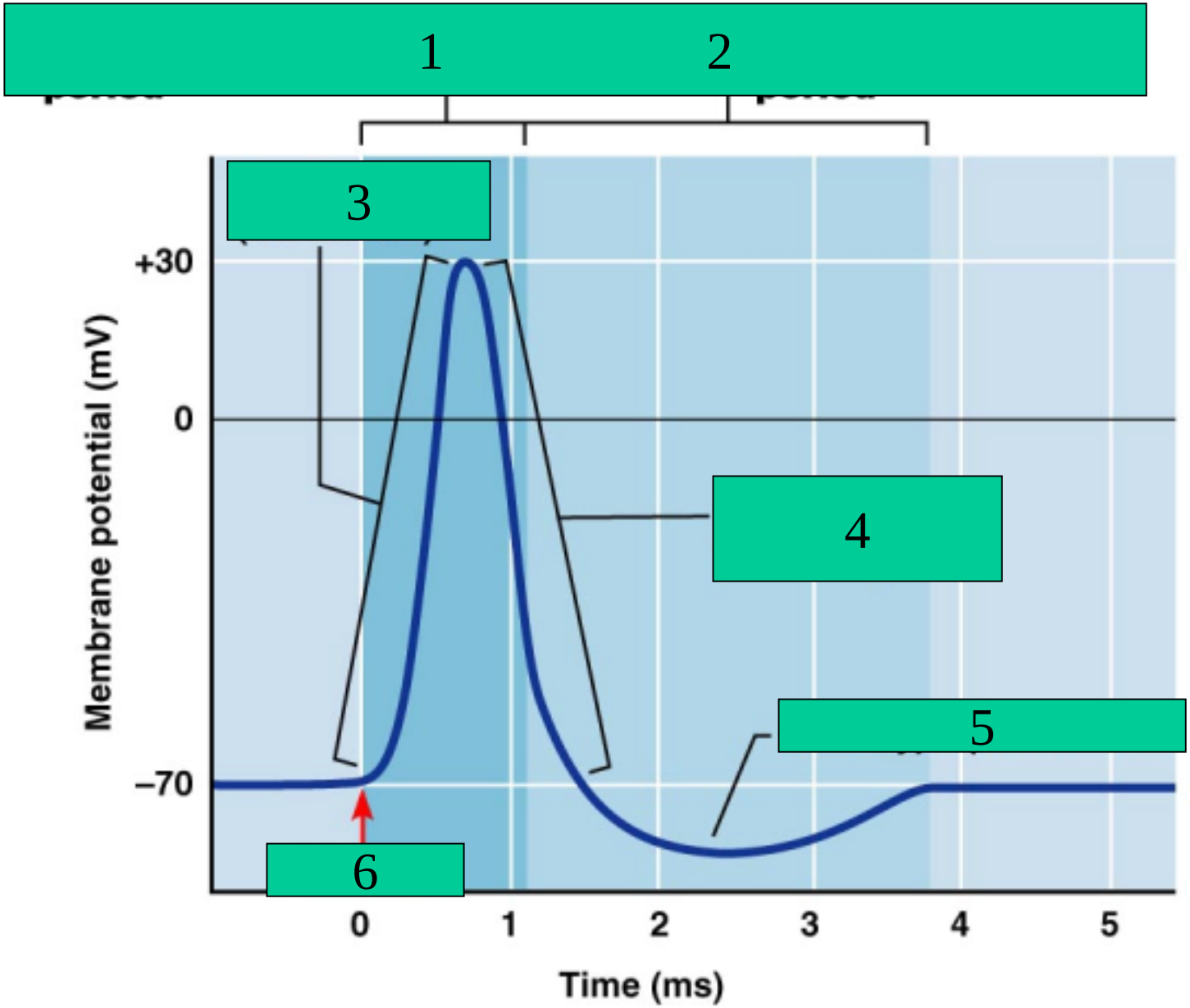
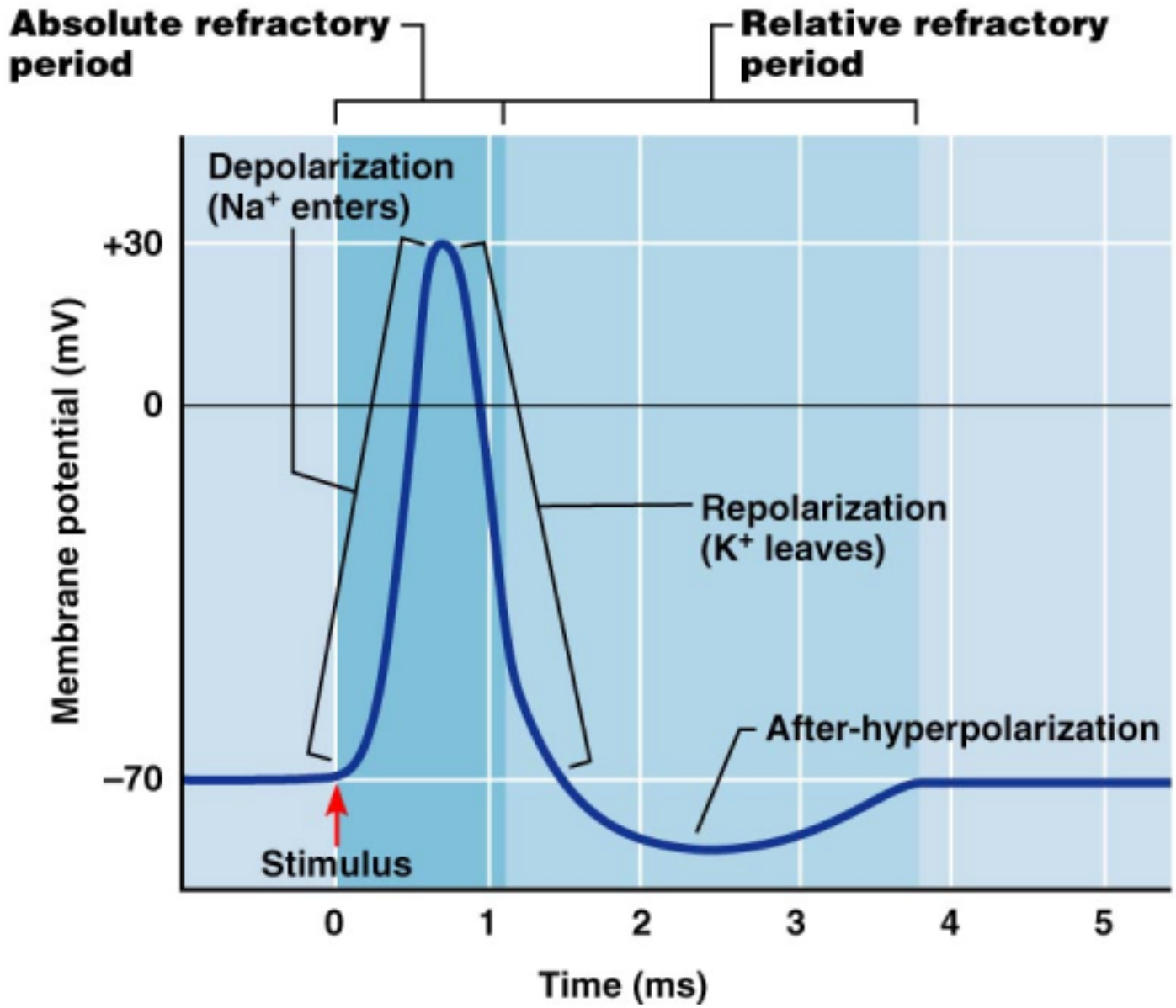
12
8
10
(b)

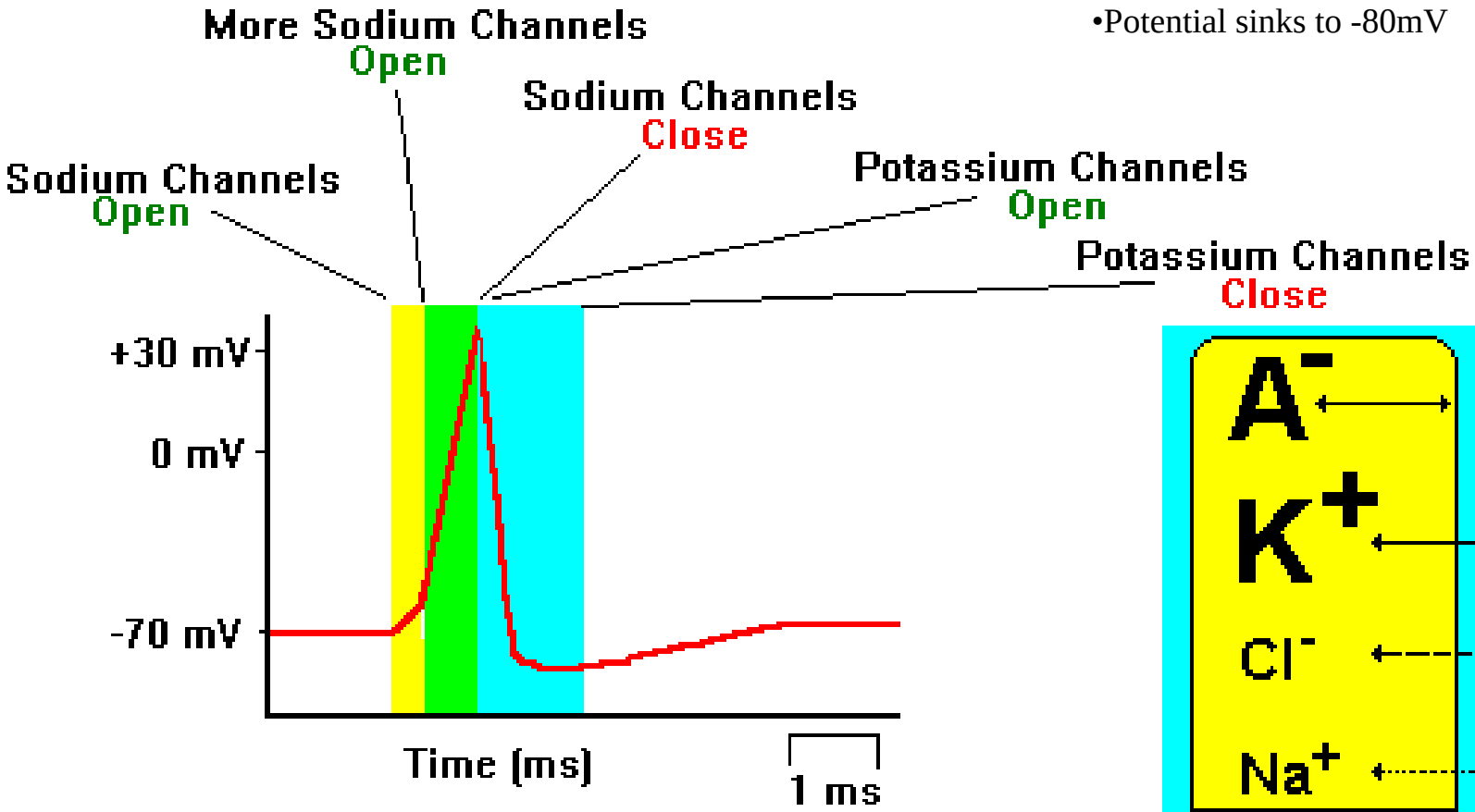


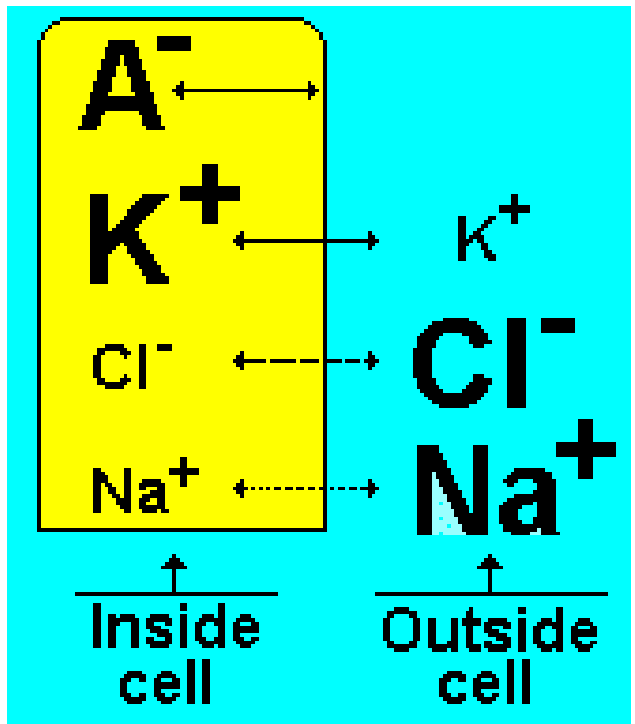



Absolute refractory period
Relative refractory period
Depolarization (Na+ enters)
+30
0
–70
Membrane potential (mV)
Repolarization (K+ leaves)
After-hyperpolarization
Stimulus
0
1
2
3
4
5
Time (ms)

Action Potential

- 'Nerve impulse'
- Produced when 'threshold potential' (-55mV) reached
- Sodium channels open
  - Sodium ions enter
  - Potential rises to +30mV
- Potassium channels open
  - Potassium ions exit
  - Potential sinks to -80mV





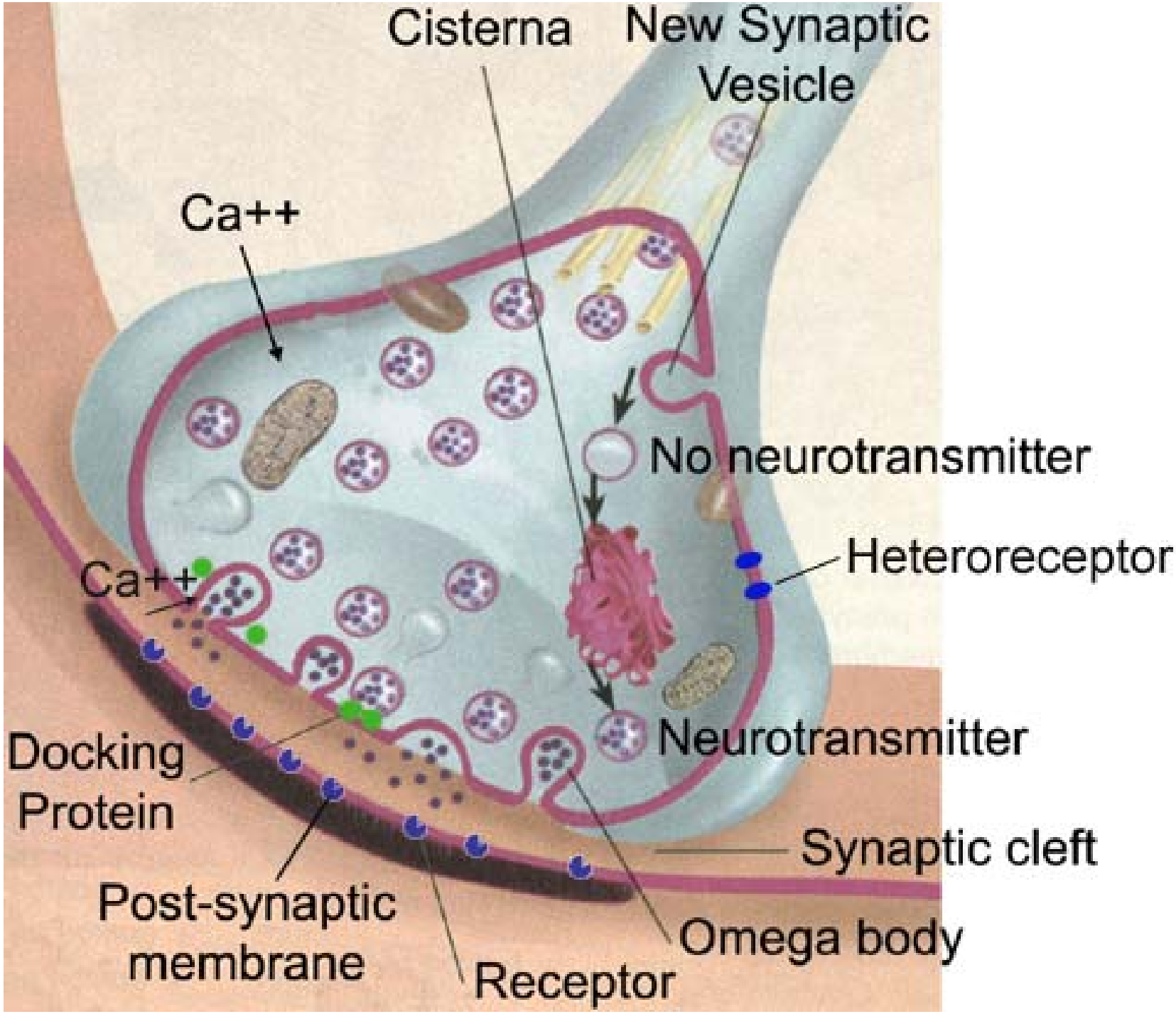
Neuronal Transmission?

- **Communication via chemicals (neurotransmitters)**
- **Neurotransmitter passed from presynpatic to postsynaptic neuron**
- **Receptor sites are sensitive to a particular transmitter**
- **Excitation / inhibition of postsynaptic neuron**

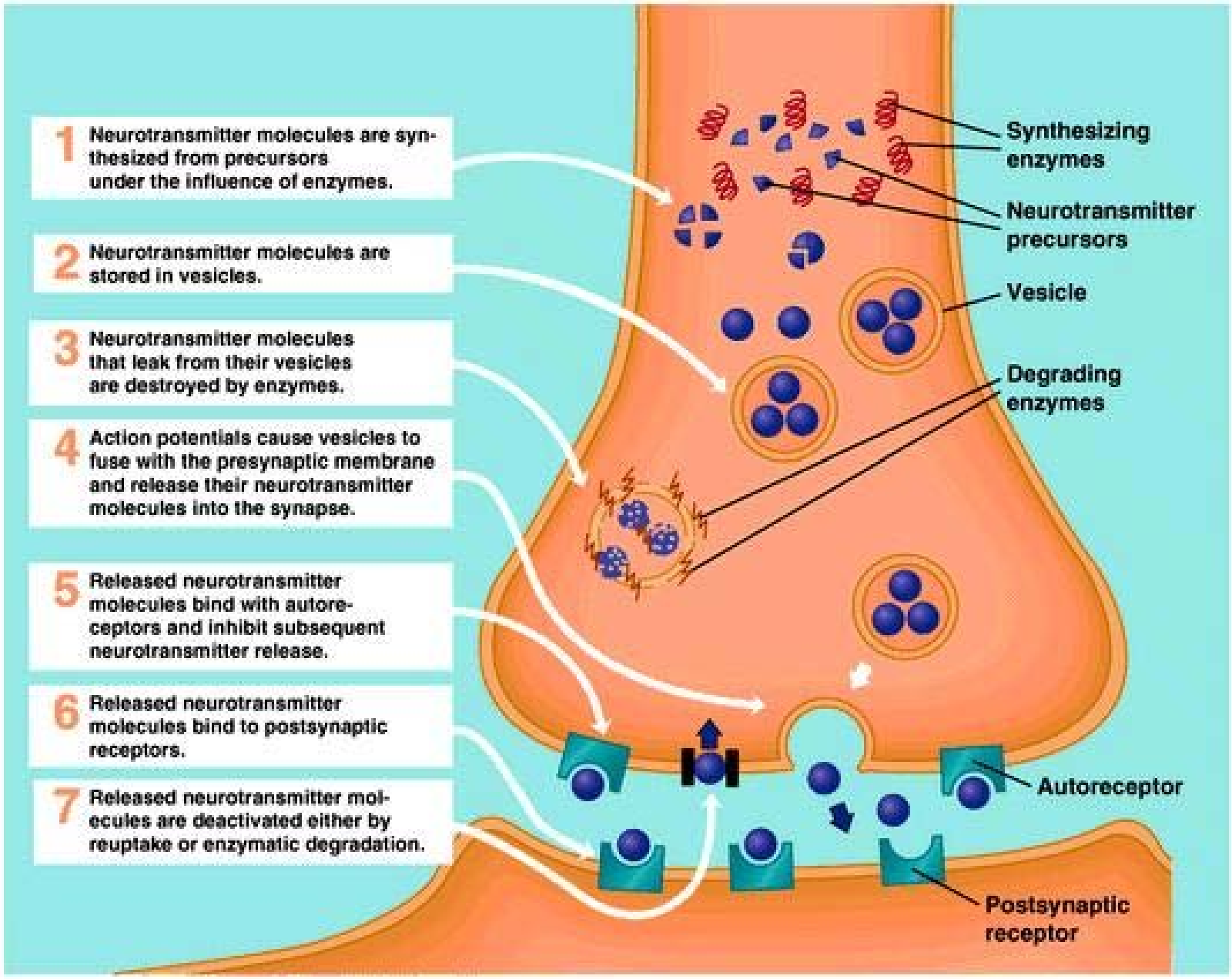
If threshold is reached, the signal is passed along

Neurotransmitters

- **Classical Neurotransmitters'**
  - Noradrenaline, Dopamine, Serotonin, GABA, Achetylcholine, Glutamate
- **Neuromodulators**
  - Modulate the effect of neurotransmitters
- **Agonists & Antagonists**
  - Mimic / block effects of neurotransmitters
  - Used to treat organic brain disorders

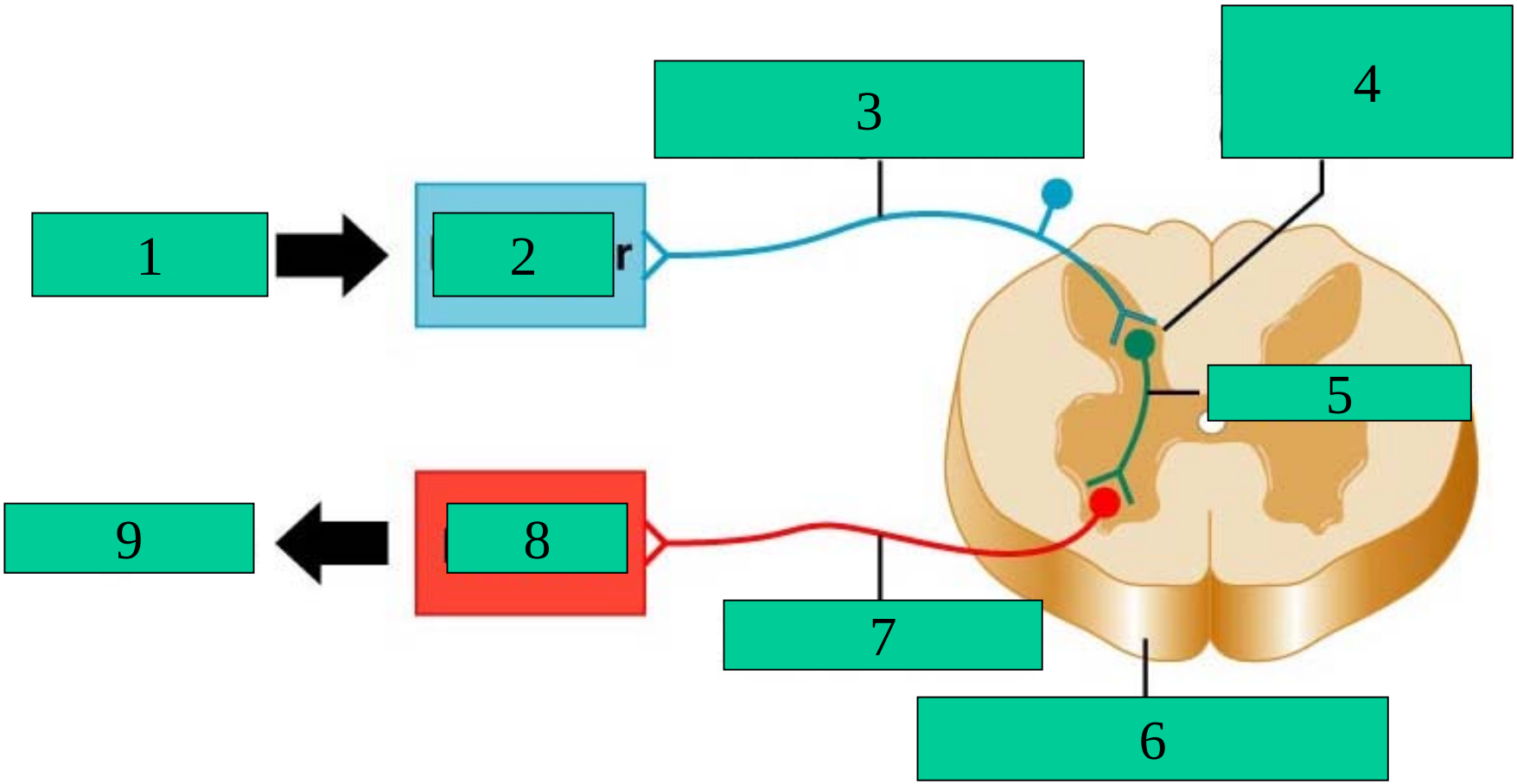

Cisterna
New Synaptic Vesicle
Ca++
No neurotransmitter
Heteroreceptor
Ca++
Neurotransmitter
Docking Protein
Synaptic cleft
Post-synaptic membrane
Omega body
Receptor

► Seven Processes in Neurotransmitter Action



Resting Potential

- -70mv voltage difference between inside & outside of cell
- How / why?
  - Different ionic concentrations
  - Ion=charged atom
  - Higher concentration of sodium ions outside cell (10:1)
  - Higher concentration of potassium ions inside cell (40:1)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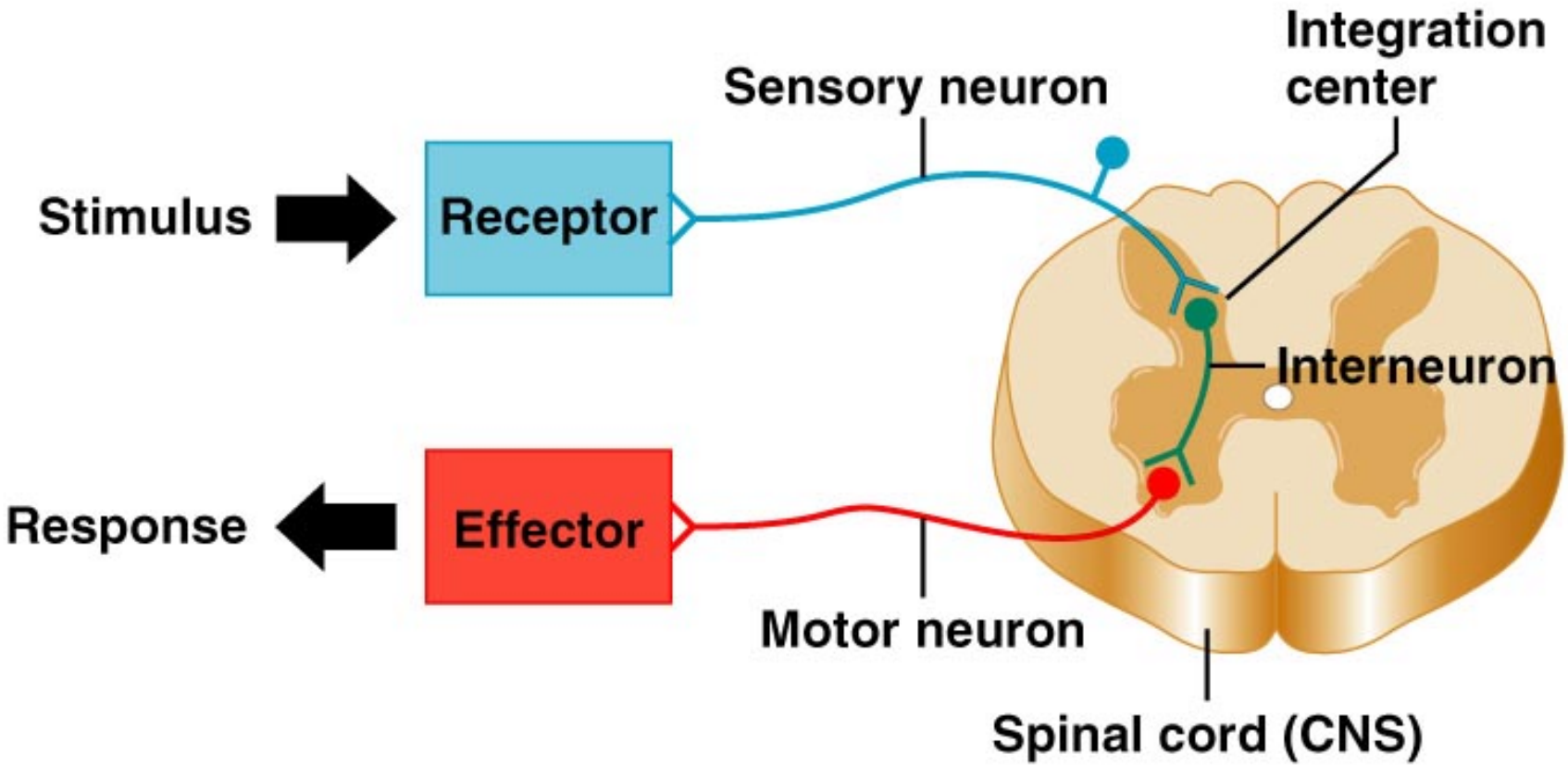

Integration center
Sensory neuron
Stimulus
Receptor
Interneuron
Response
Effector
Motor neuron
Spinal cord (CNS)

Telencephalon – cerebrum?

cortex, white matter, and basal nuclei

Diencephalon?

Thalamus , hypothalamus, and epithalamus

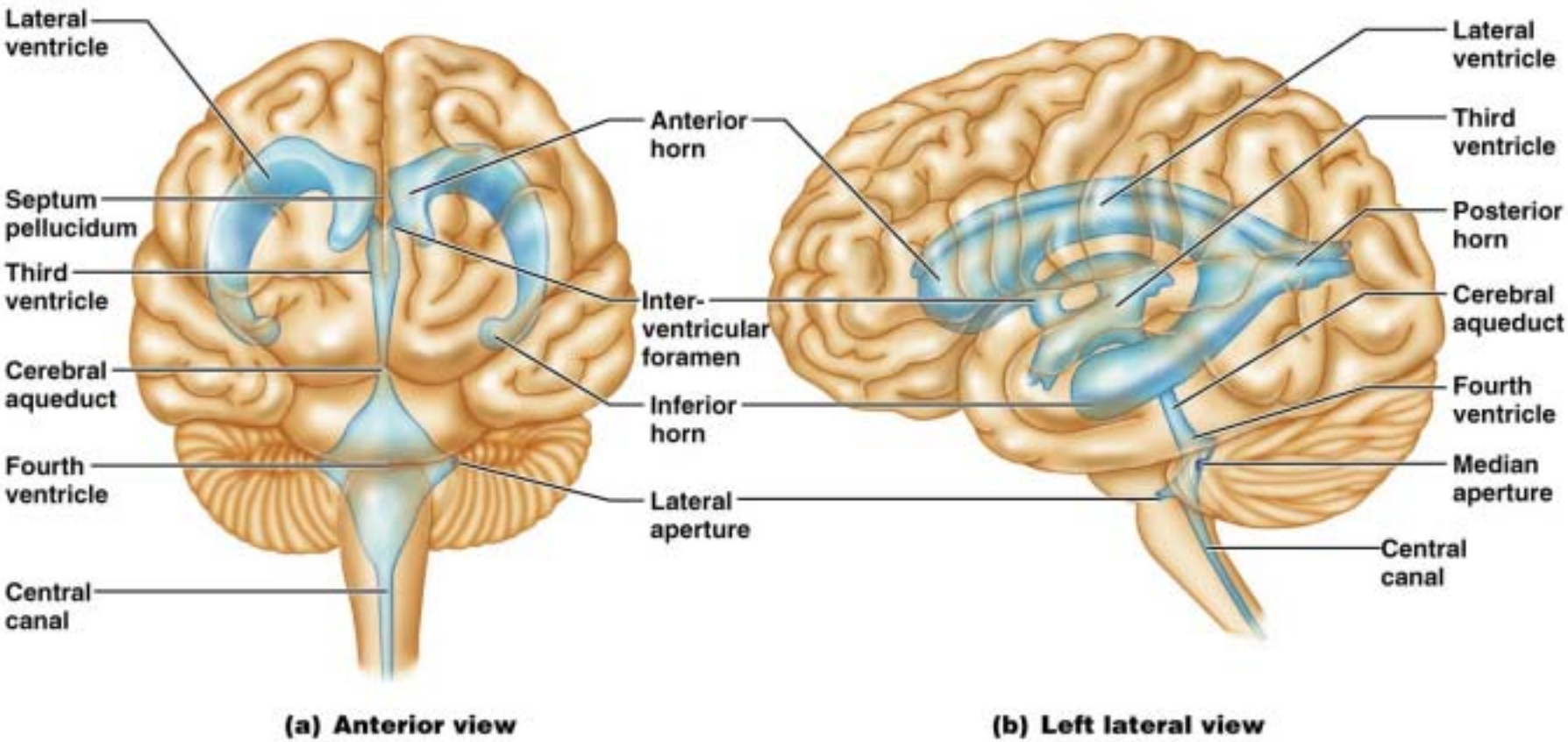
Mesencephalon – brain stem:?

midbrain

Metencephalon – brain stem:?

Pons, CERBELLUM

VENTRICLES


Lateral ventricle
Septum pellucidum
Third ventricle
Cerebral aqueduct
Fourth ventricle
Central canal
Anterior horn
Inter-ventricular foramen
Inferior horn
Lateral aperture
(a) Anterior view
Lateral ventricle
Third ventricle
Posterior horn
Cerebral aqueduct
Fourth ventricle
Median aperture
Central canal
(b) Left lateral view

Myelencephalon – brain stem:?

medulla oblongata

Different types of neurons ?

1. (pseudo)unipolar – dorsal root ganglion neurons
2. bipolar - retina
3. multipolar (most common) – motor neuron, pyramidal cells in cerebrum, Purkinje cells in cerebellum

Different types of assistance cells or glia ?

1. **oligodendrocytes** – myelinate CNS neurons
2. Schwann cells – myelinate PNS neurons
3. astrocytes – supply nutrition to neurons, form cellular architecture of CNS
4. **microglia** – remove waste and cellular debris from the CNS

ependymal cells – form a layer between ventricles & cellular environment

Cranial Nerve:		Major Functions:
I Olfactory		
II Optic		
III Oculomotor		
IV Trochlear		
V Trigeminal		

Cranial Nerve:		Major Functions:
I Olfactory		smell
II Optic		vision
III Oculomotor		eyelid and eyeball movement
V Trigeminal		chewing face & mouth touch & pain

Which of the following is NOT a function of cranial nerve III?

a.elevation of eyes
b.adduction of eyes
c.constriction of pupil
d.dilatation of pupil
e.changing the shape of the lens

Which of the following is NOT a function of cranial nerve III?

d.dilatation of pupil

The dilator pupillae is supplied by sympathetic fibers.
Preganglionic fibers arise from the lateral horn of the spinal cord at T 1 level and end in the superior cervical ganglion.
Postganglionic axons reach the dilator by way of blood vessels to the eye.

Trigeminal nerve:

a.is a mixed cranial nerve with both motor and sensory functions
b.has a sensory ganglion
c.innervates the muscles of mastication
d.does not carry preganglionic parasympathetic fibers
e.all of the above are true

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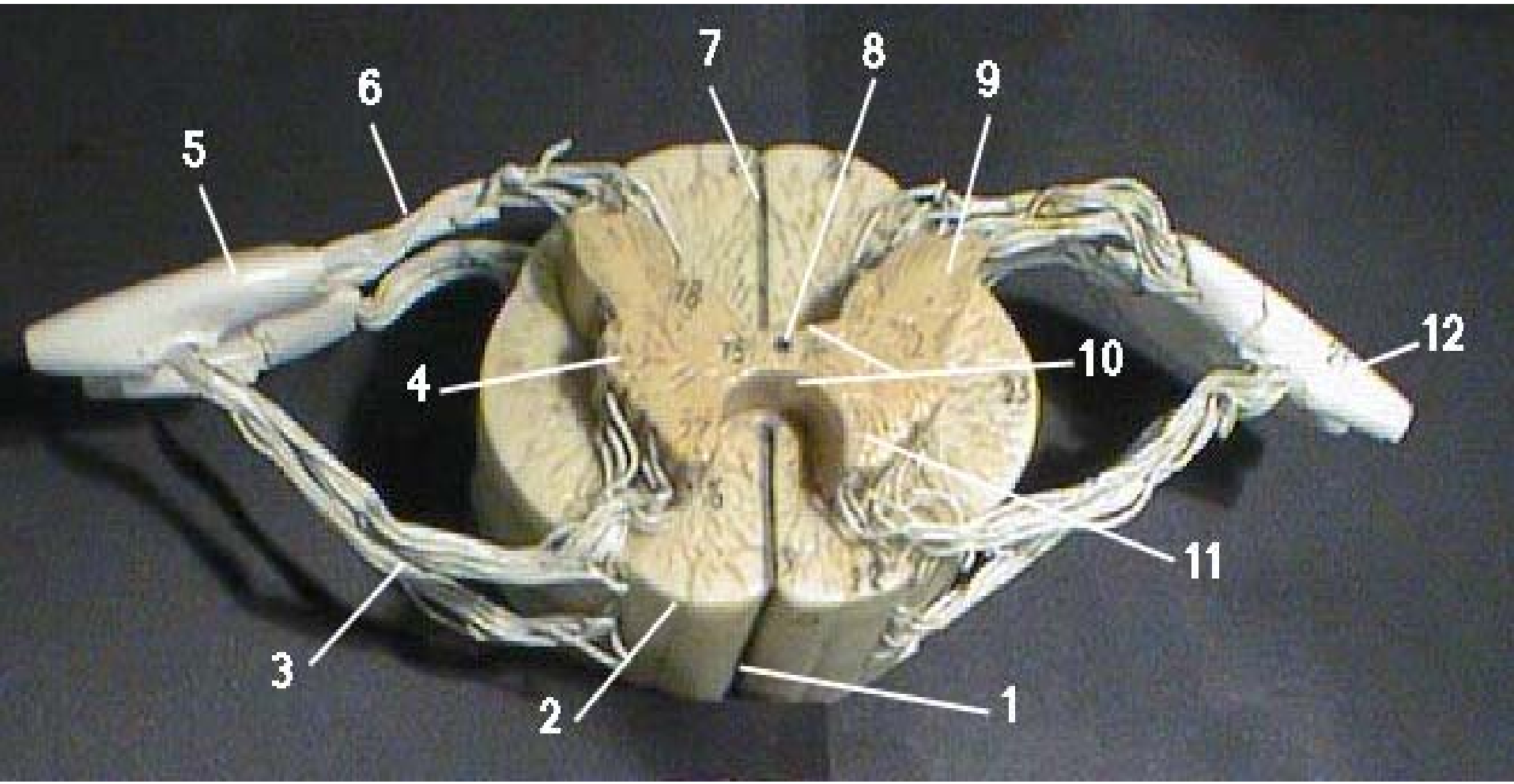
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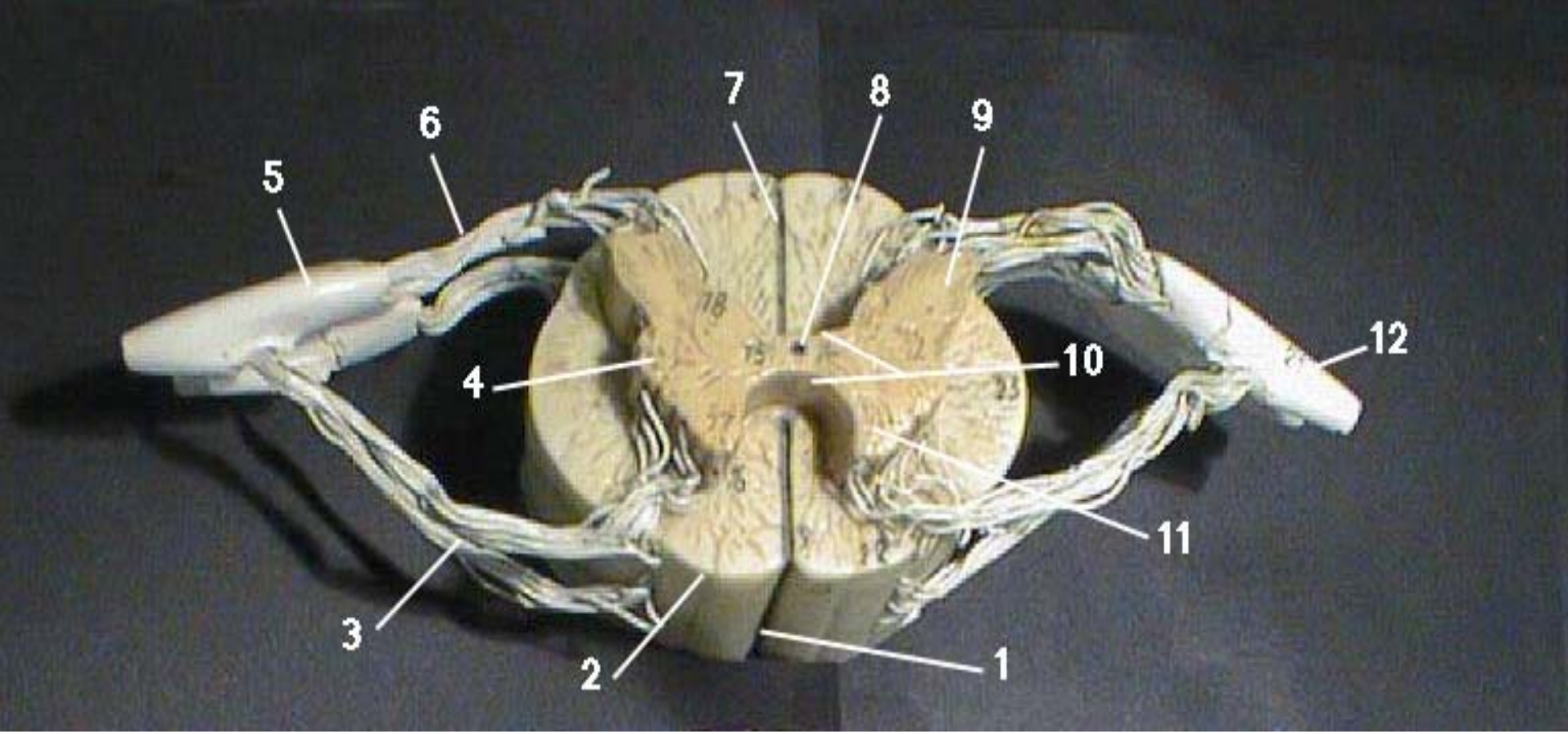
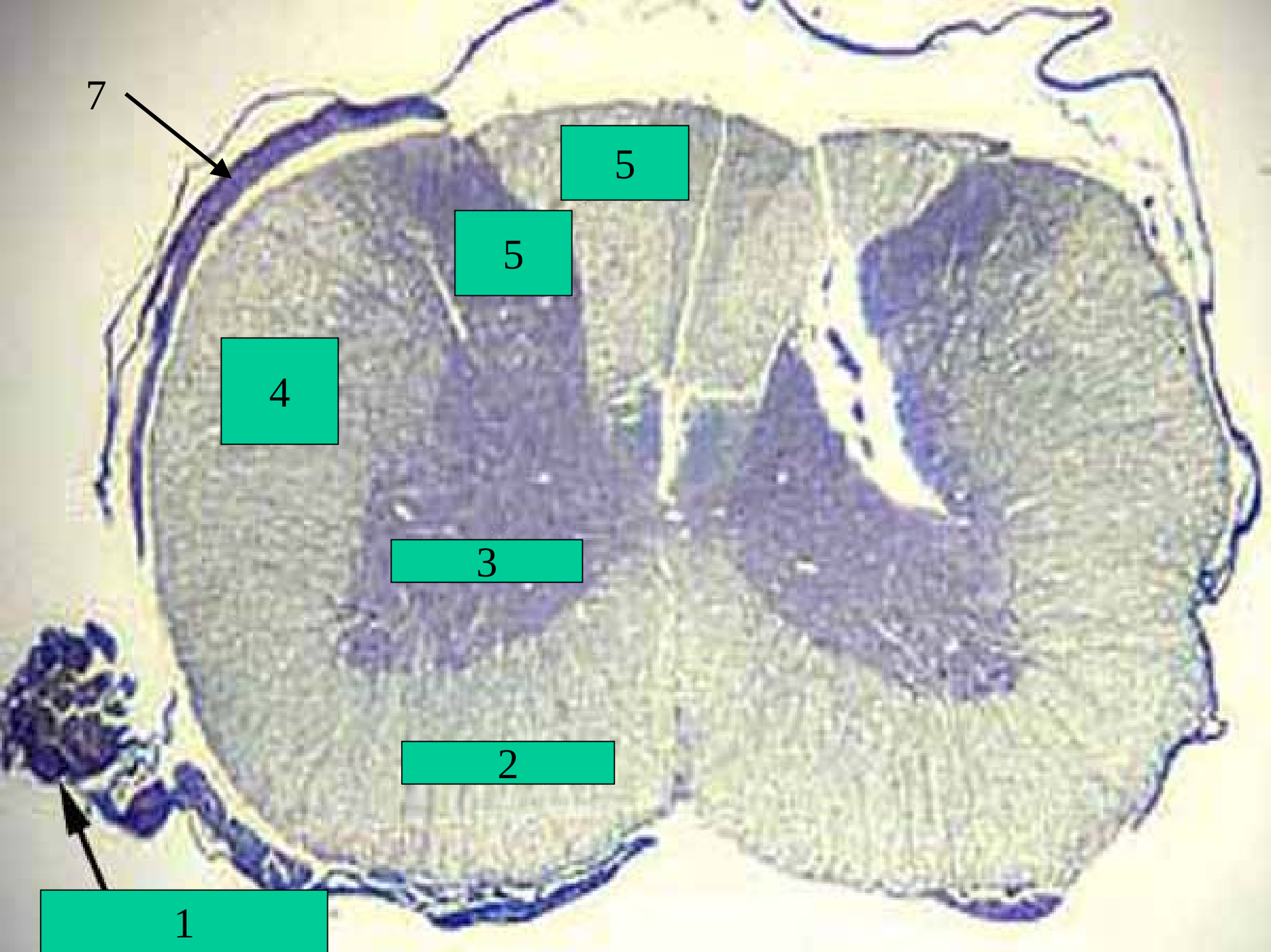
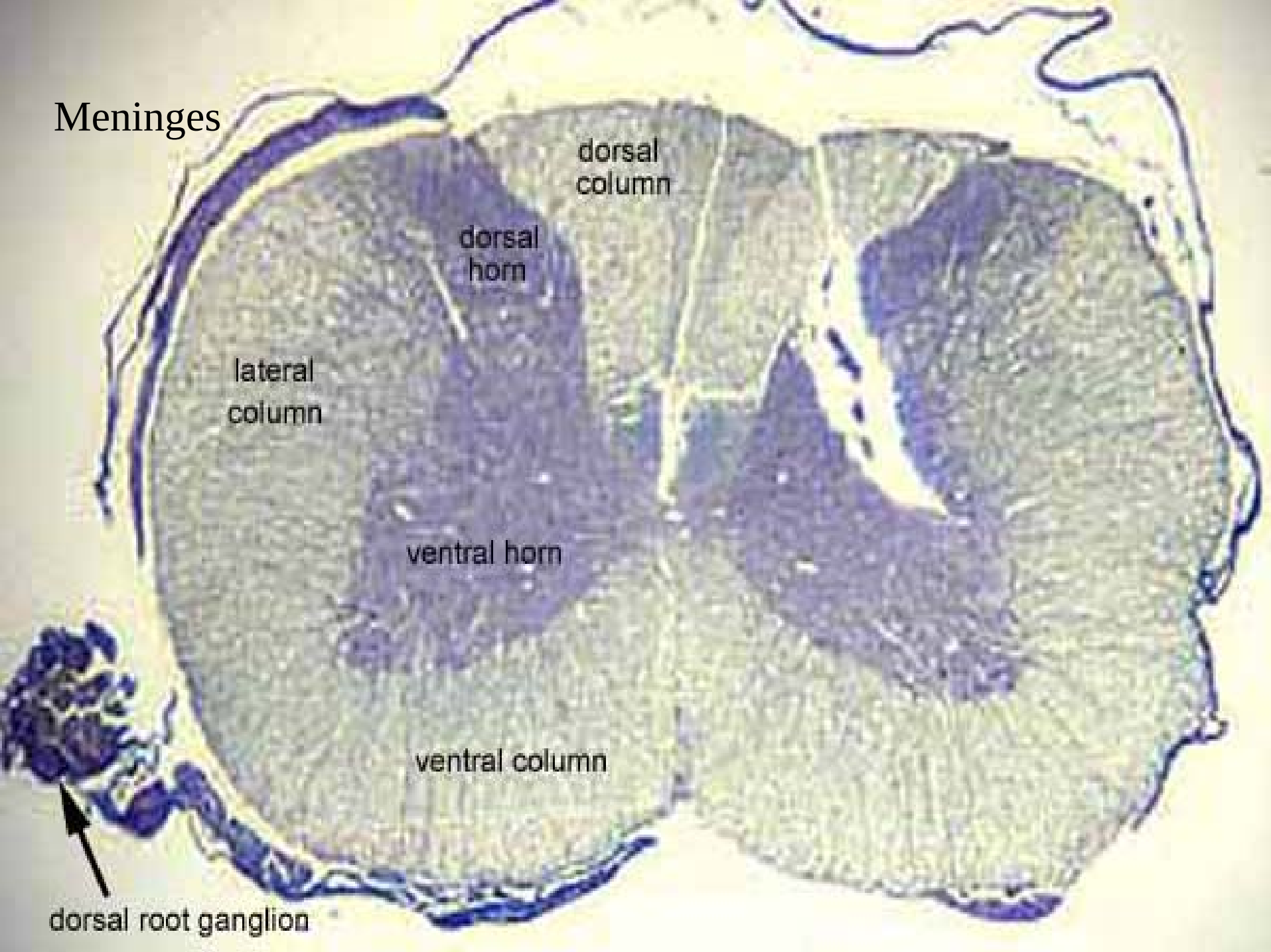
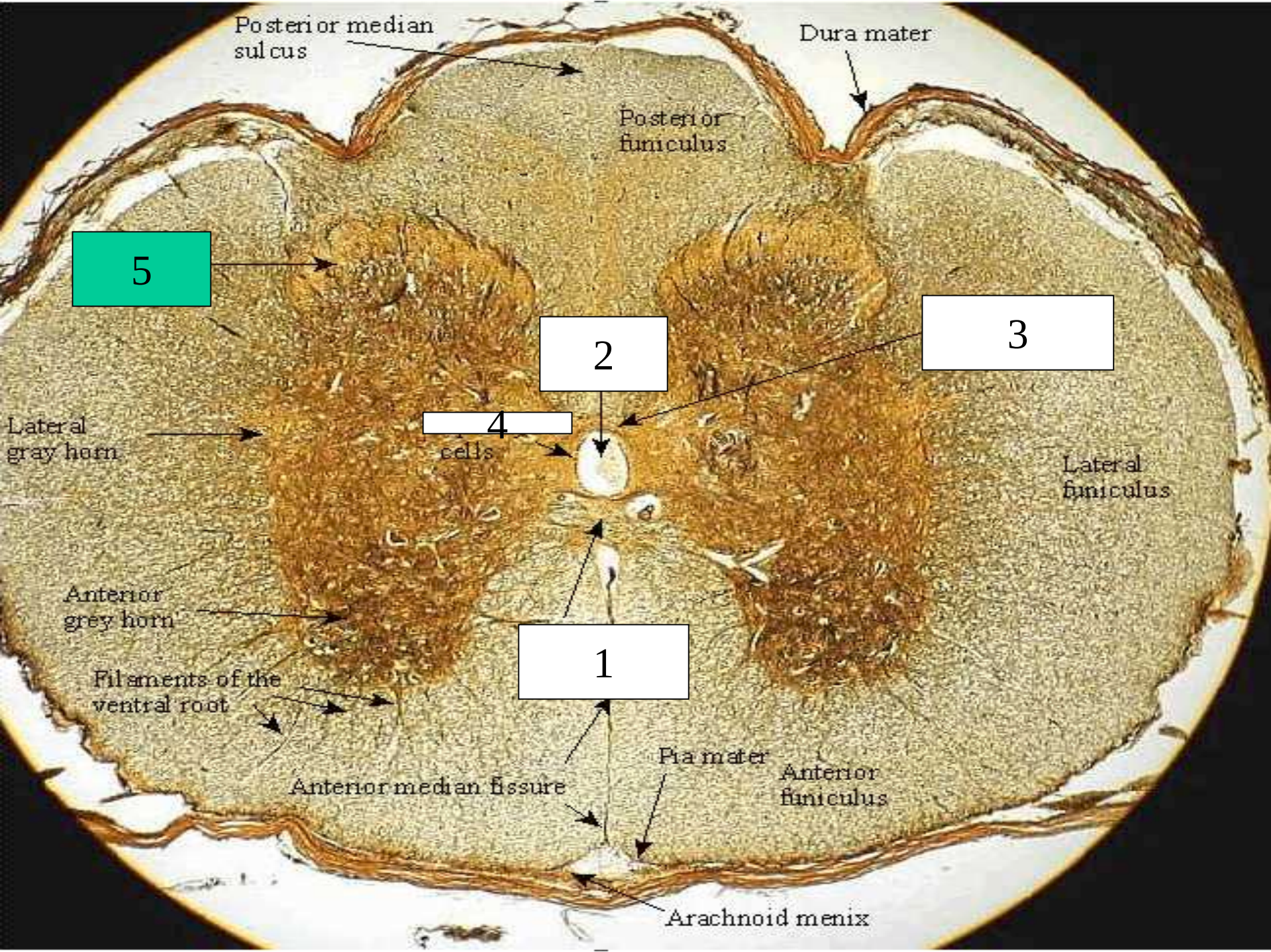
11
12

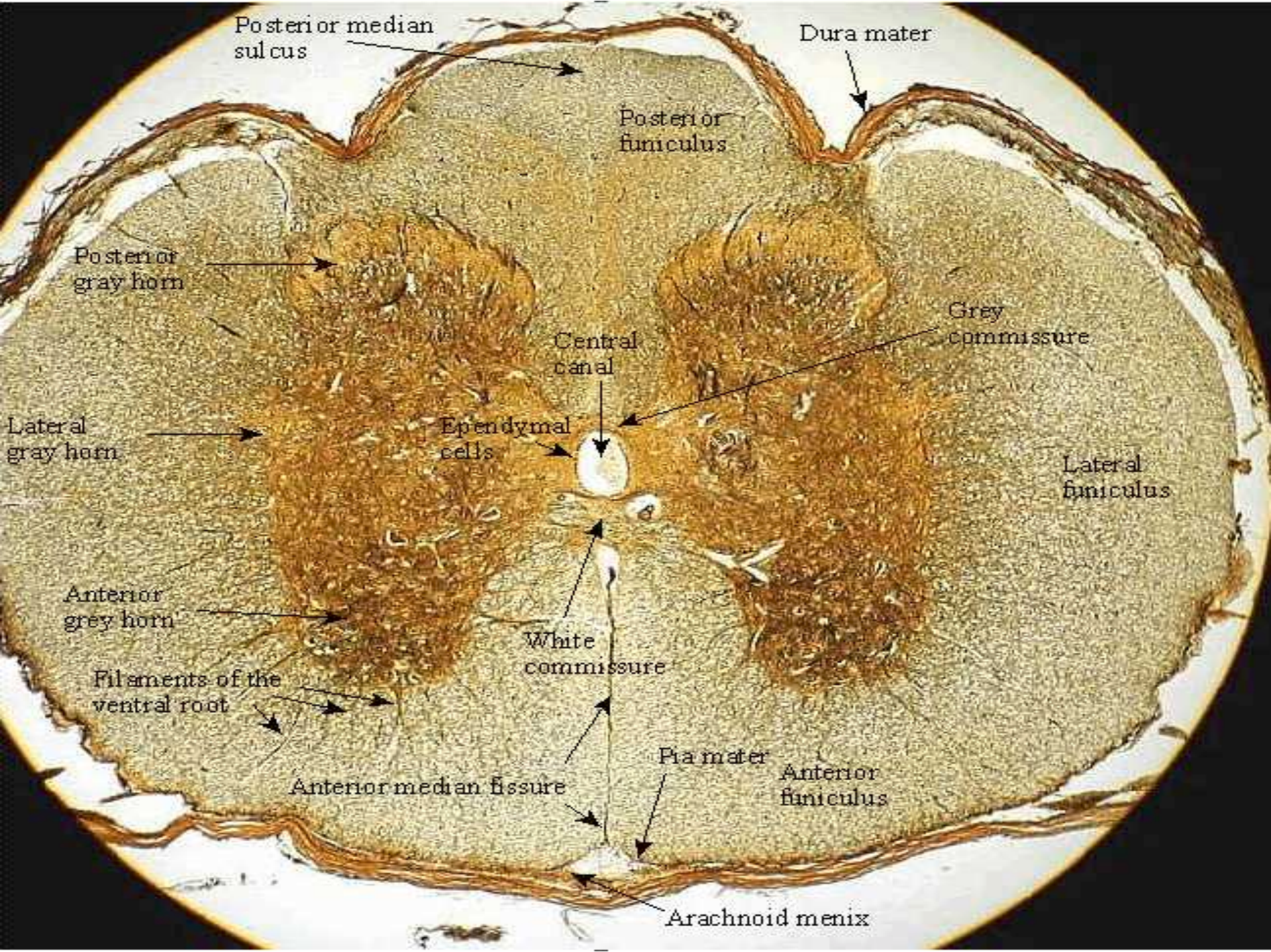


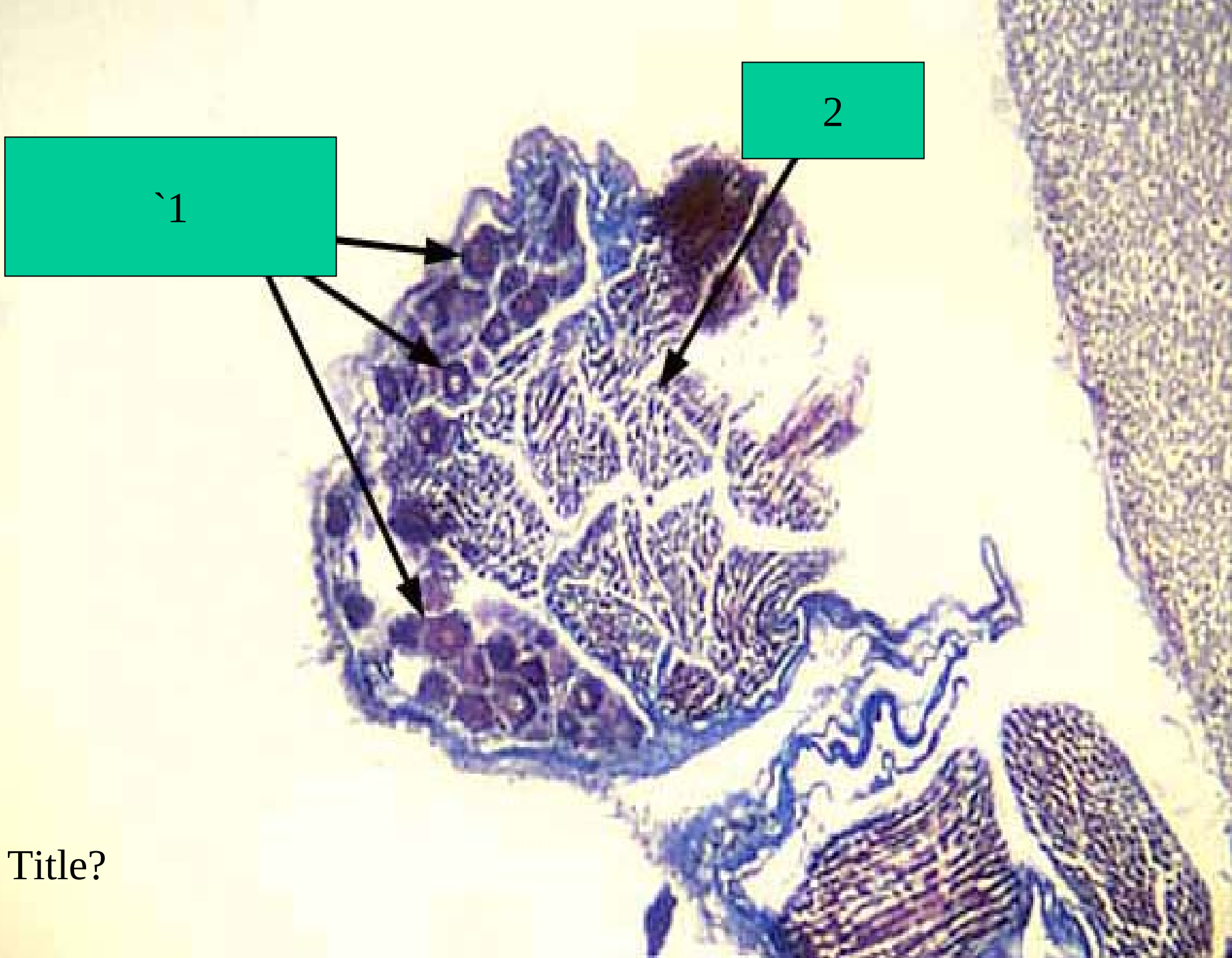
1. Anterior (Ventral) Median Fissure 7. Posterior (Dorsal) Median Sulcus 2. White Matter 8. Central Canal 3. Ventral Root (Motor) 9. Posterior Gray Horn (Sensory) 4. Gray Matter 10. Gray Commissure 5. Dorsal Root Ganglia 11. Anterior Gray Horn (Motor) 6. Dorsal Root (Sensory) 12. Spinal Nerve


7
5
5
4
3
2
1

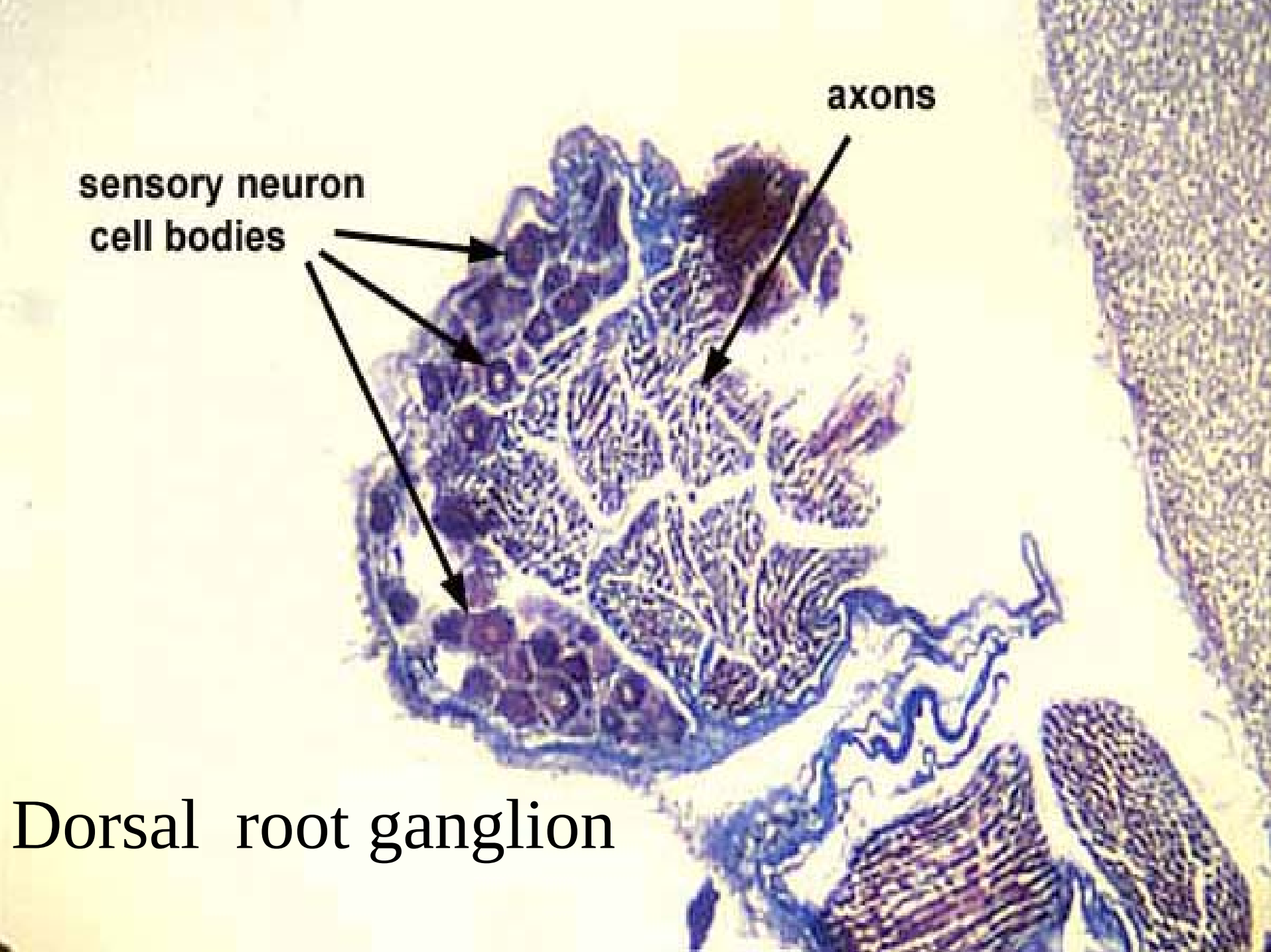

Meninges
dorsal column
dorsal horn
lateral column
ventral horn
ventral column
dorsal root ganglion


Posterior median sulcus
Dura mater
Posterior funiculus
5
2
3
4
Lateral gray horn
cells
Lateral funiculus
Anterior grey horn
1
Filaments of the ventral root
Pia mater
Anterior funiculus
Anterior median fissure
Arachnoid menix

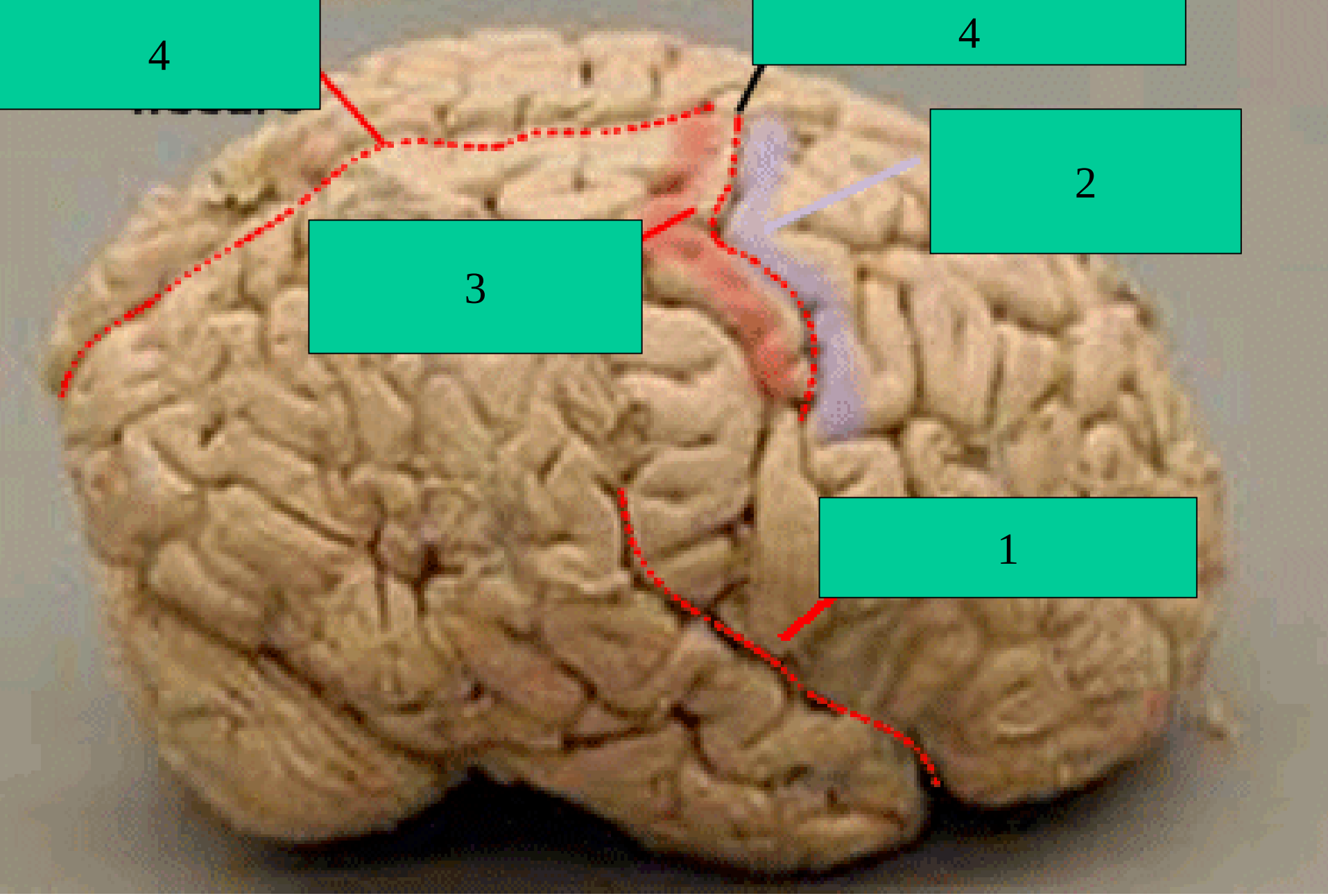

Posterior median sulcus
Dura mater
Posterior funiculus
Posterior gray horn
Grey commissure
Central canal
Lateral gray horn
Ependymal cells
Lateral funiculus
Anterior grey horn
White commissure
Filaments of the ventral root
Pia mater
Anterior funiculus
Anterior median fissure
Arachnoid menix



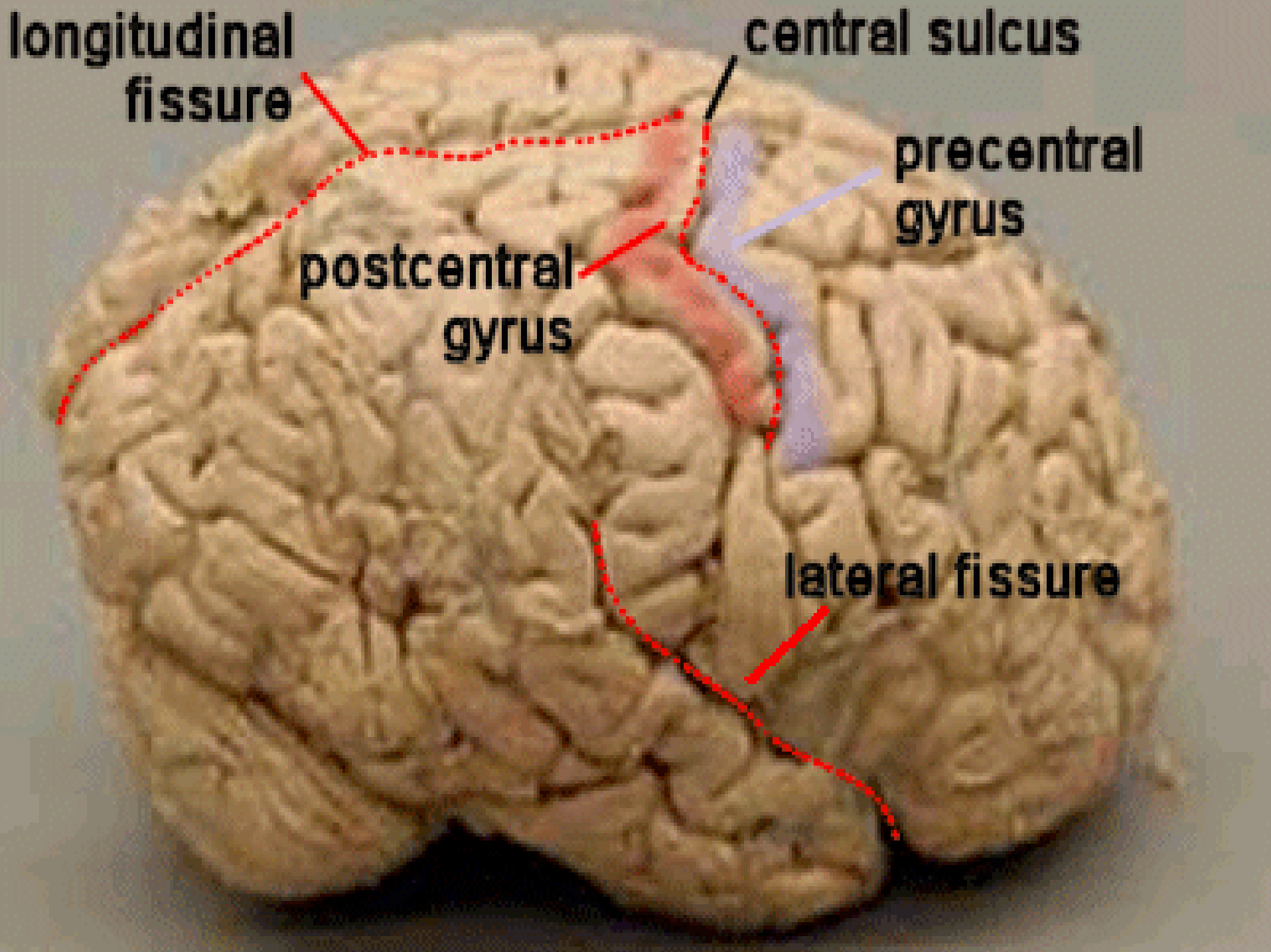
Title?

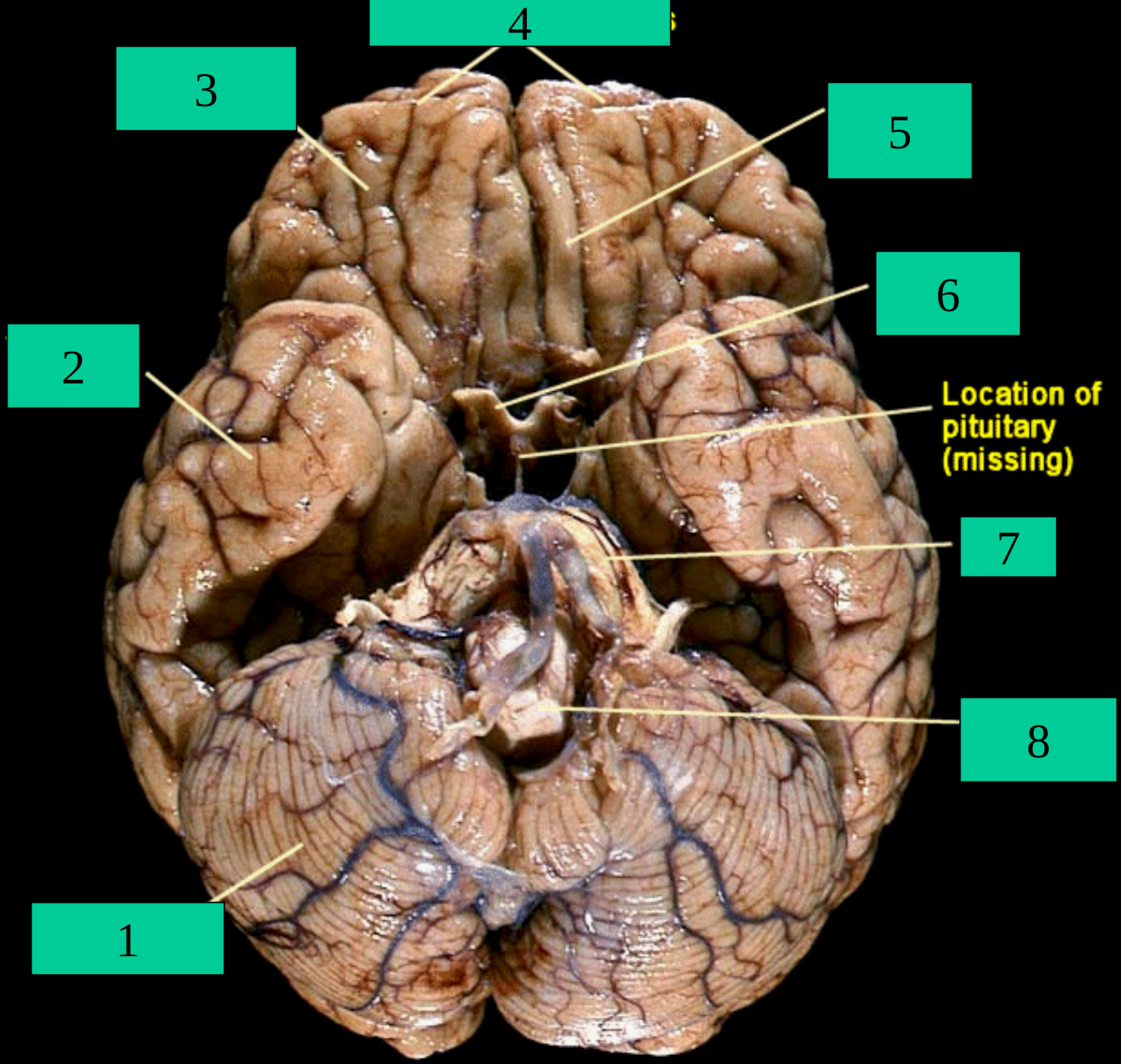


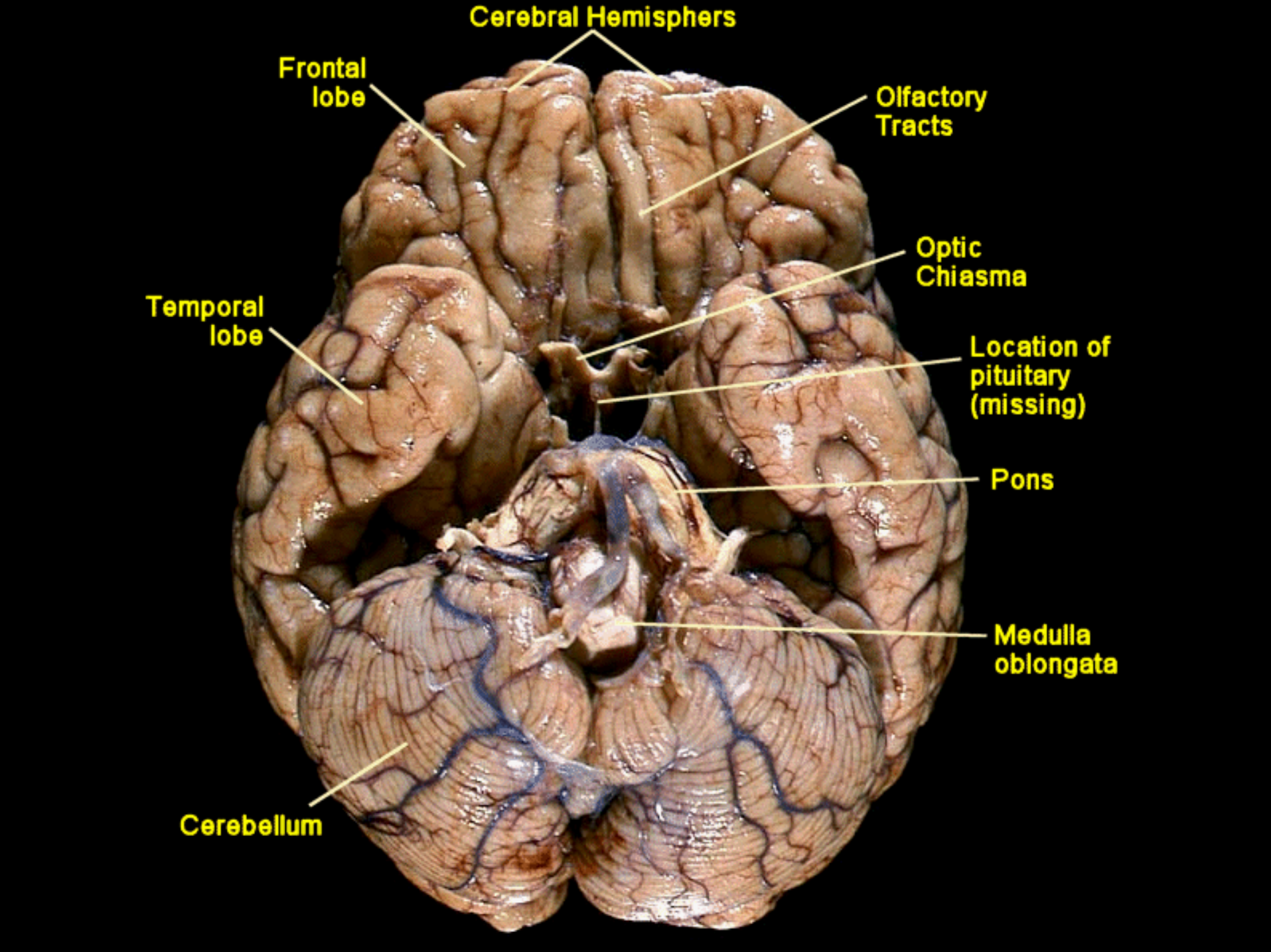
Dorsal root ganglion



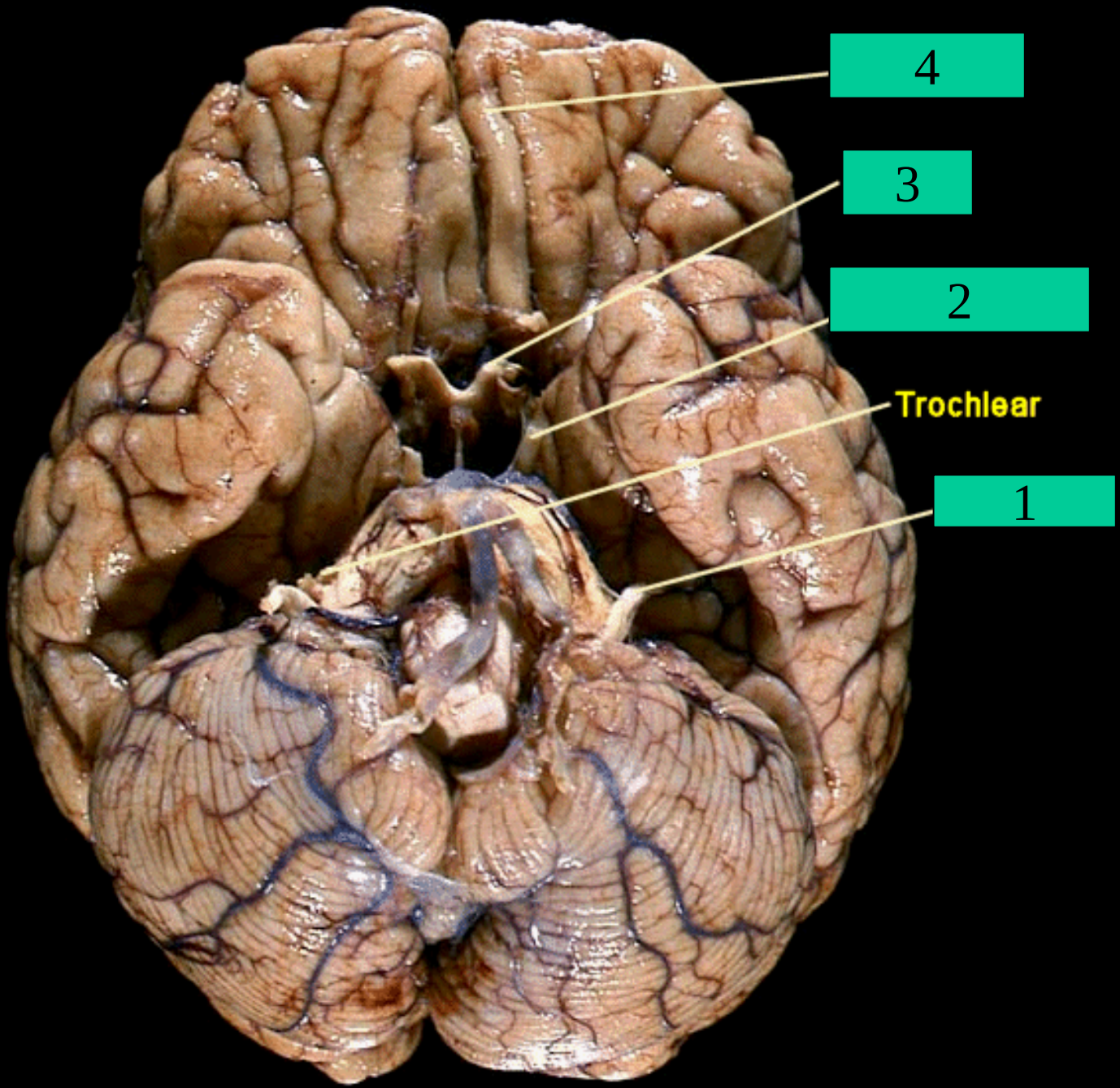
Name the gyrus , sulci and fissures


longitudinal fissure
central sulcus
precentral gyrus
postcentral gyrus
lateral fissure

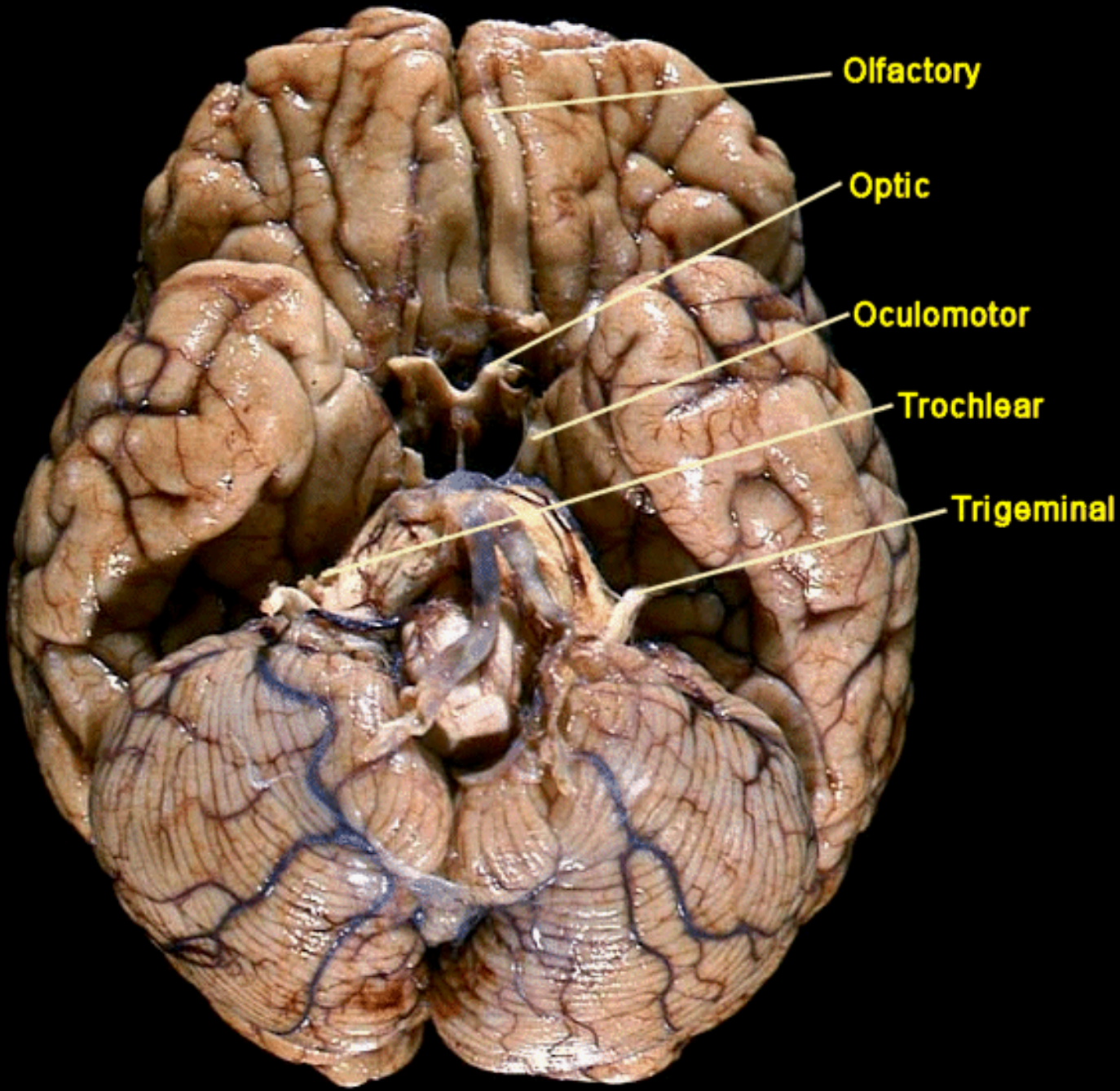

4
3
5
6
2
Location of pituitary (missing)
7
8
1


Cerebral Hemisphers
Frontal lobe
Olfactory Tracts
Optic Chiasma
Temporal lobe
Location of pituitary (missing)
Pons
Medulla oblongata
Cerebellum

Some Cranial Nerves



Some Cranial Nerves



Cerebellum

Cerebral peduncles


3


3

Cerebrum

Corpus callosum


5

Fornix


16

Fourth ventrical

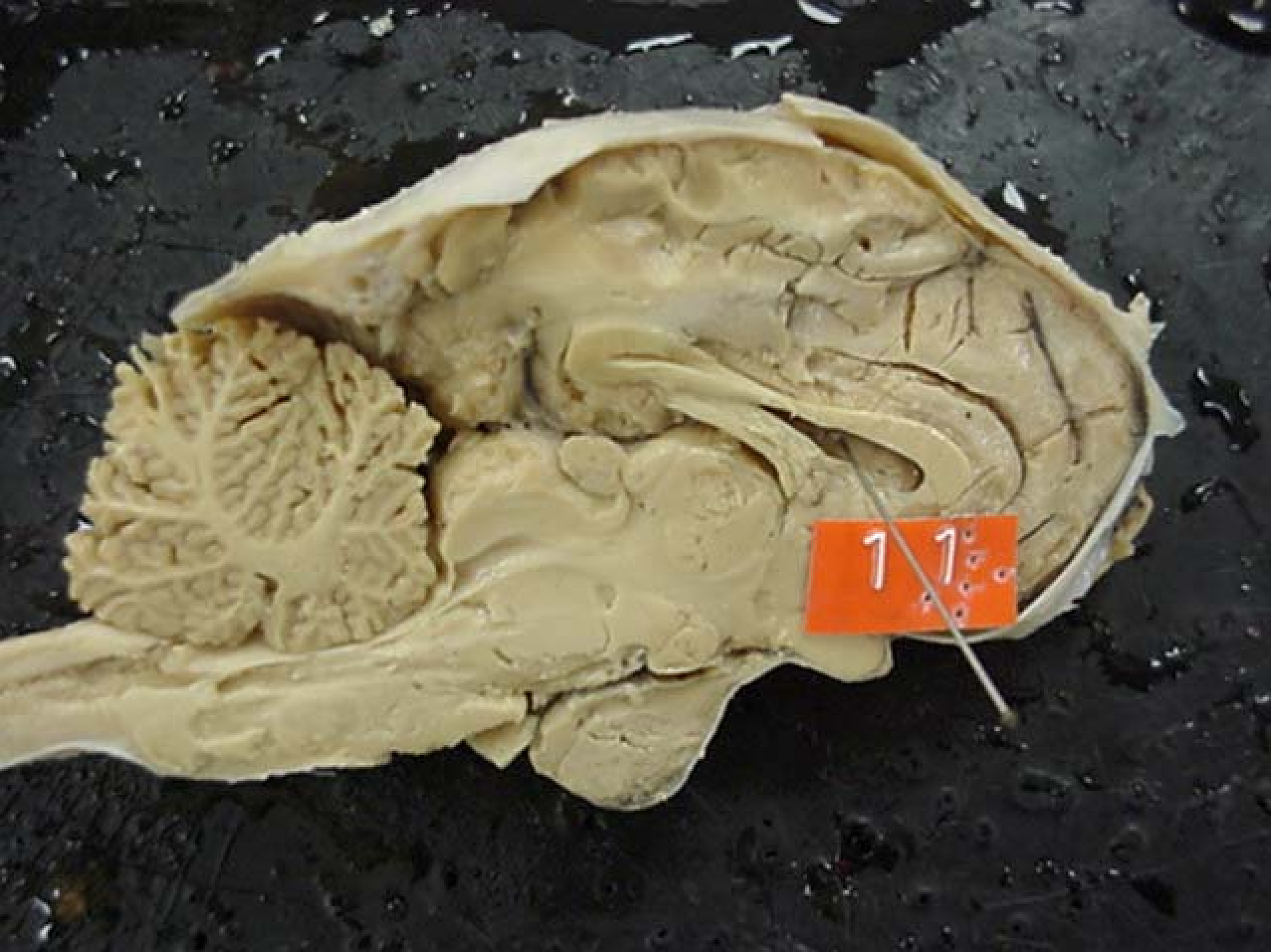
Frontal lobe

Hypothalamus


1.0


1.0

Inferior colliculi

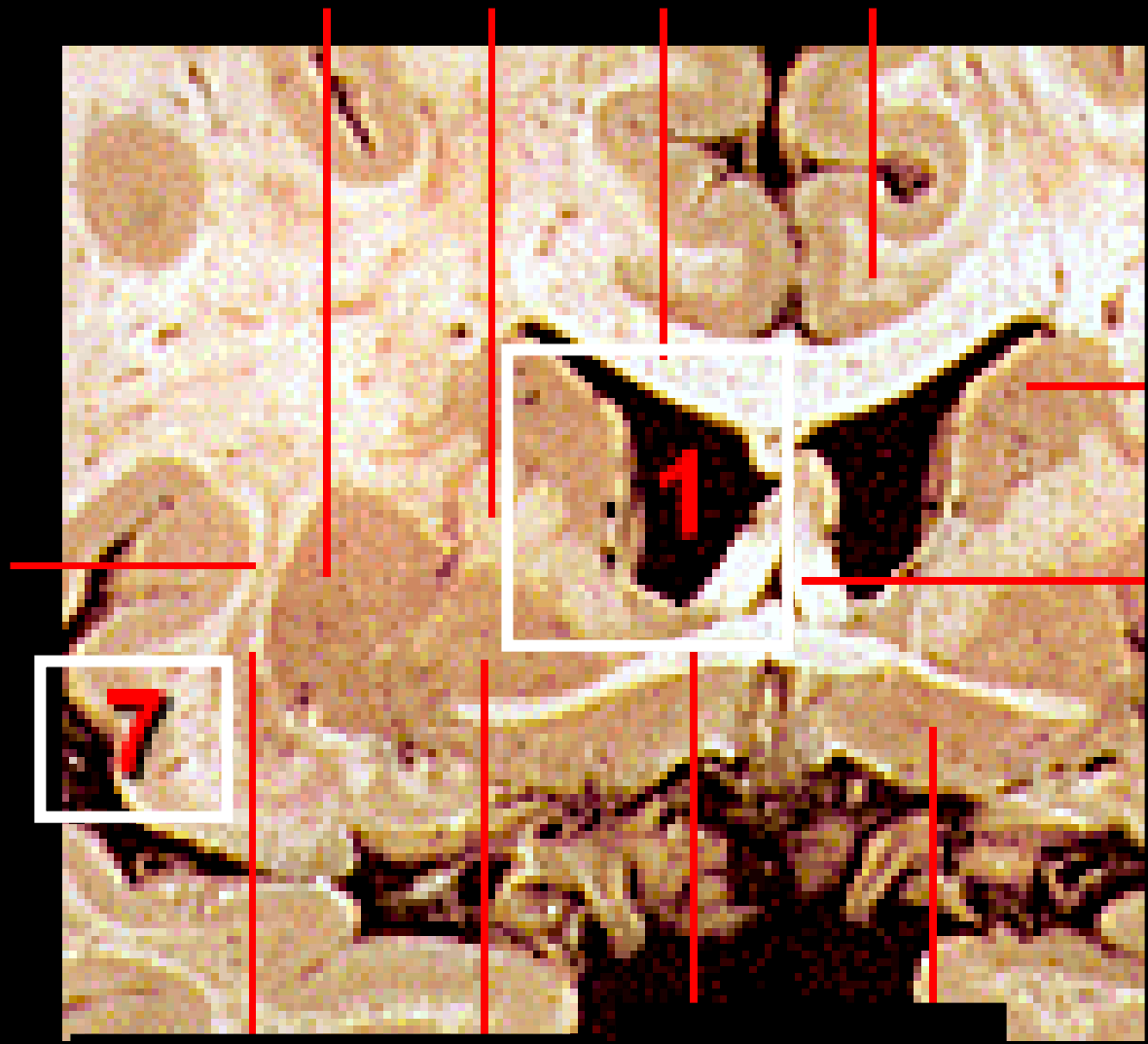

1 1

Lateral ventrical


1:3

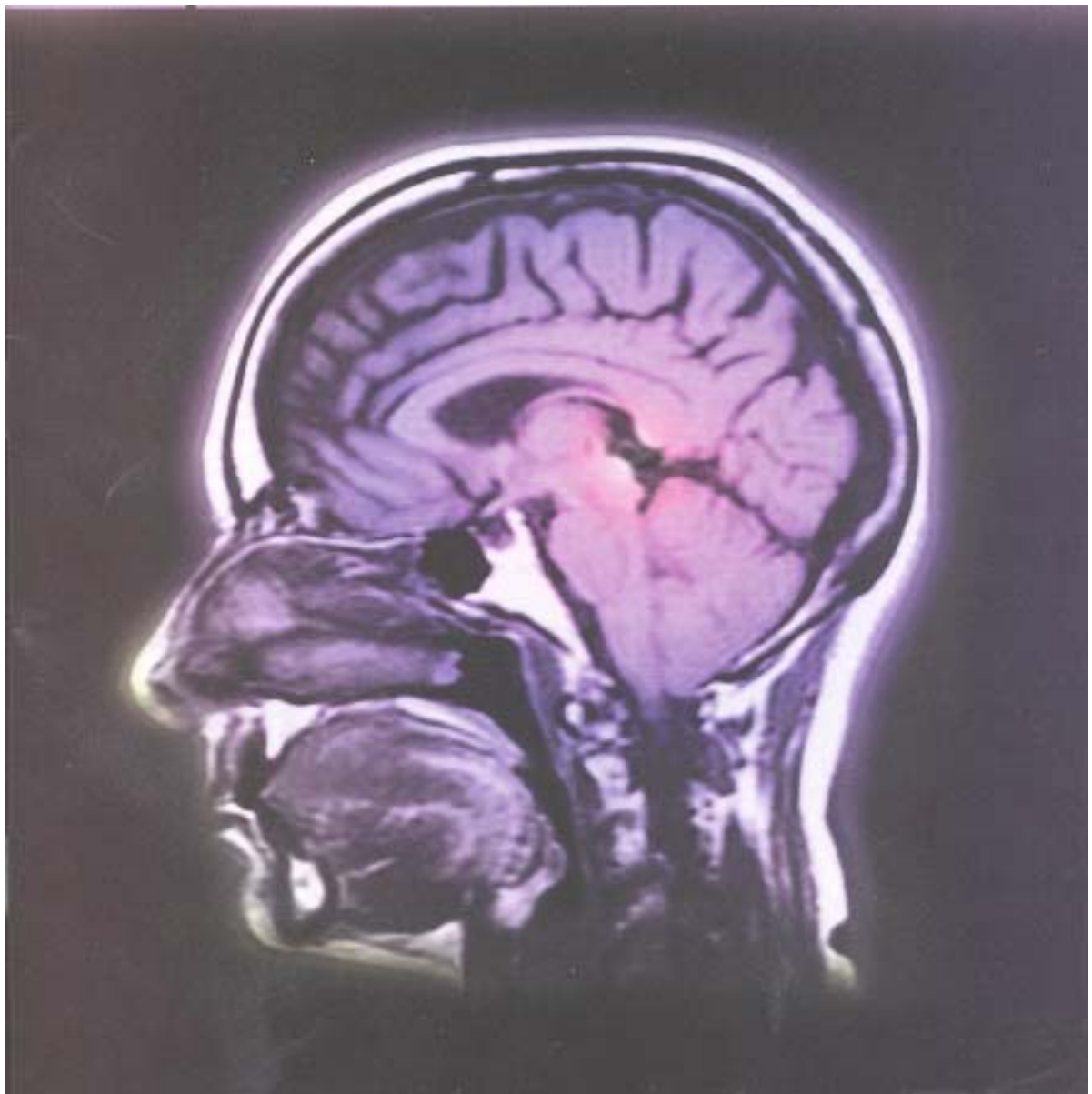

1:3

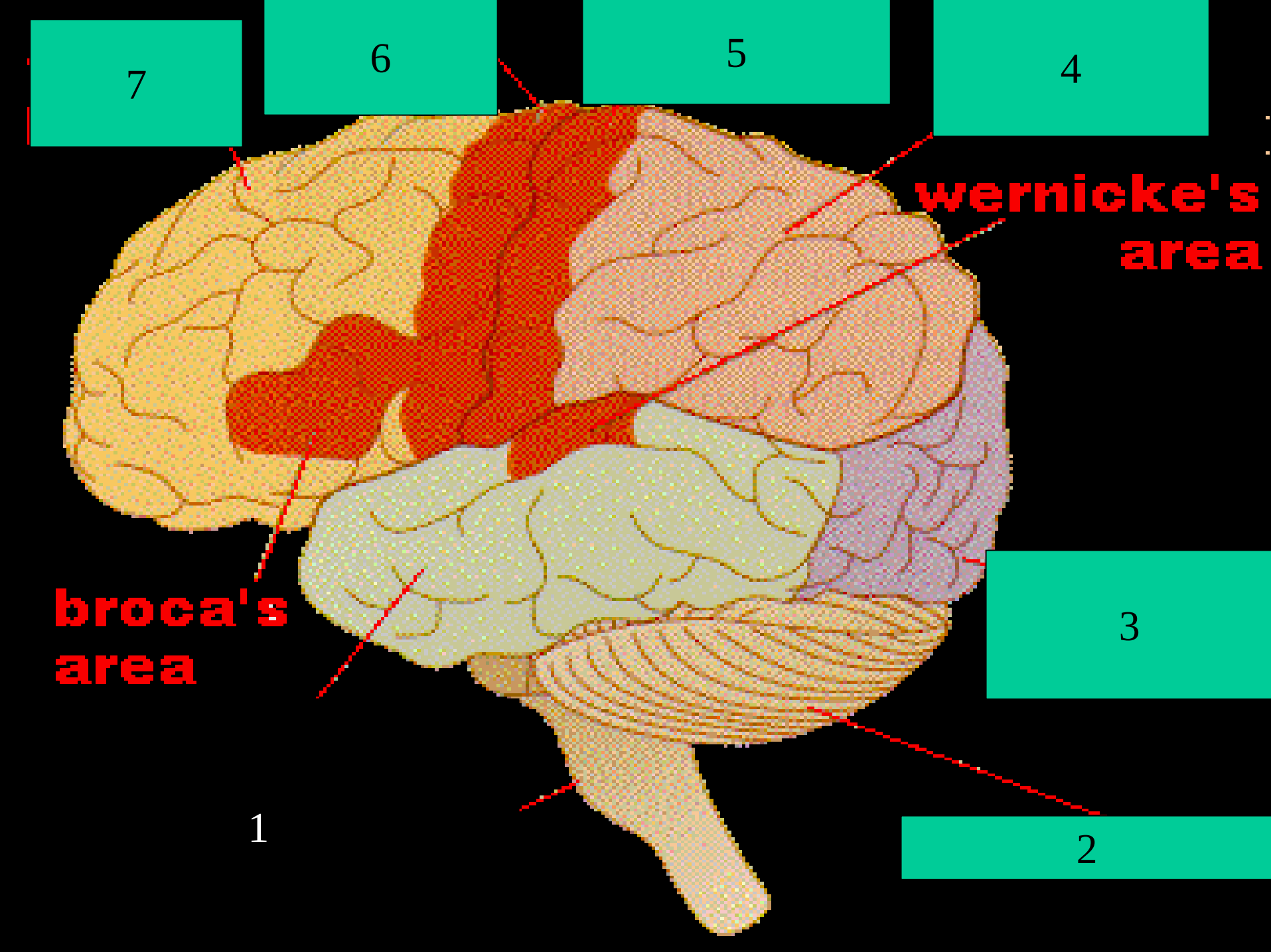
Medulla oblongata


1
7

1.Ventriculus lateralis
7. Insula

Recognize and give names




7
6
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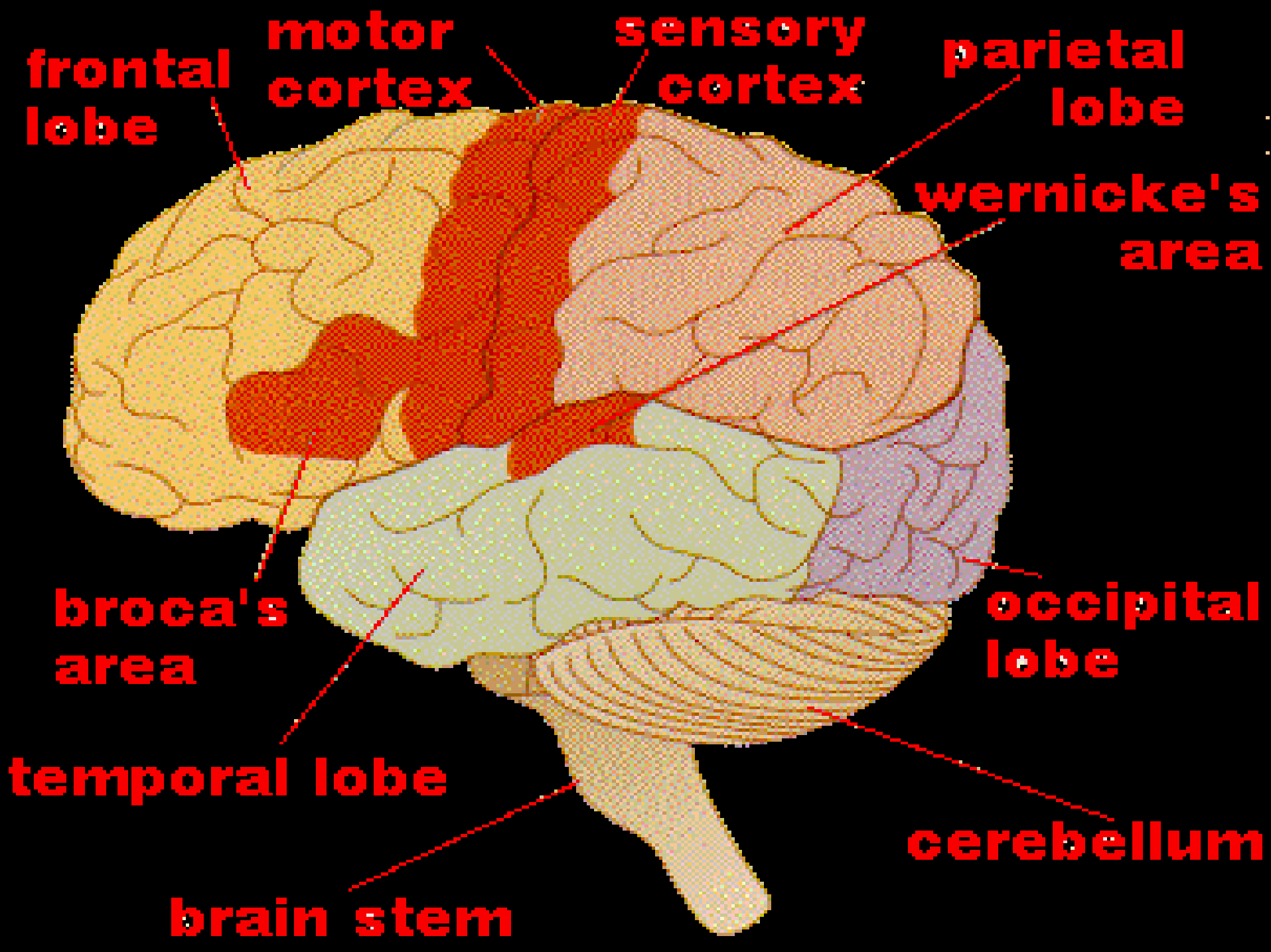
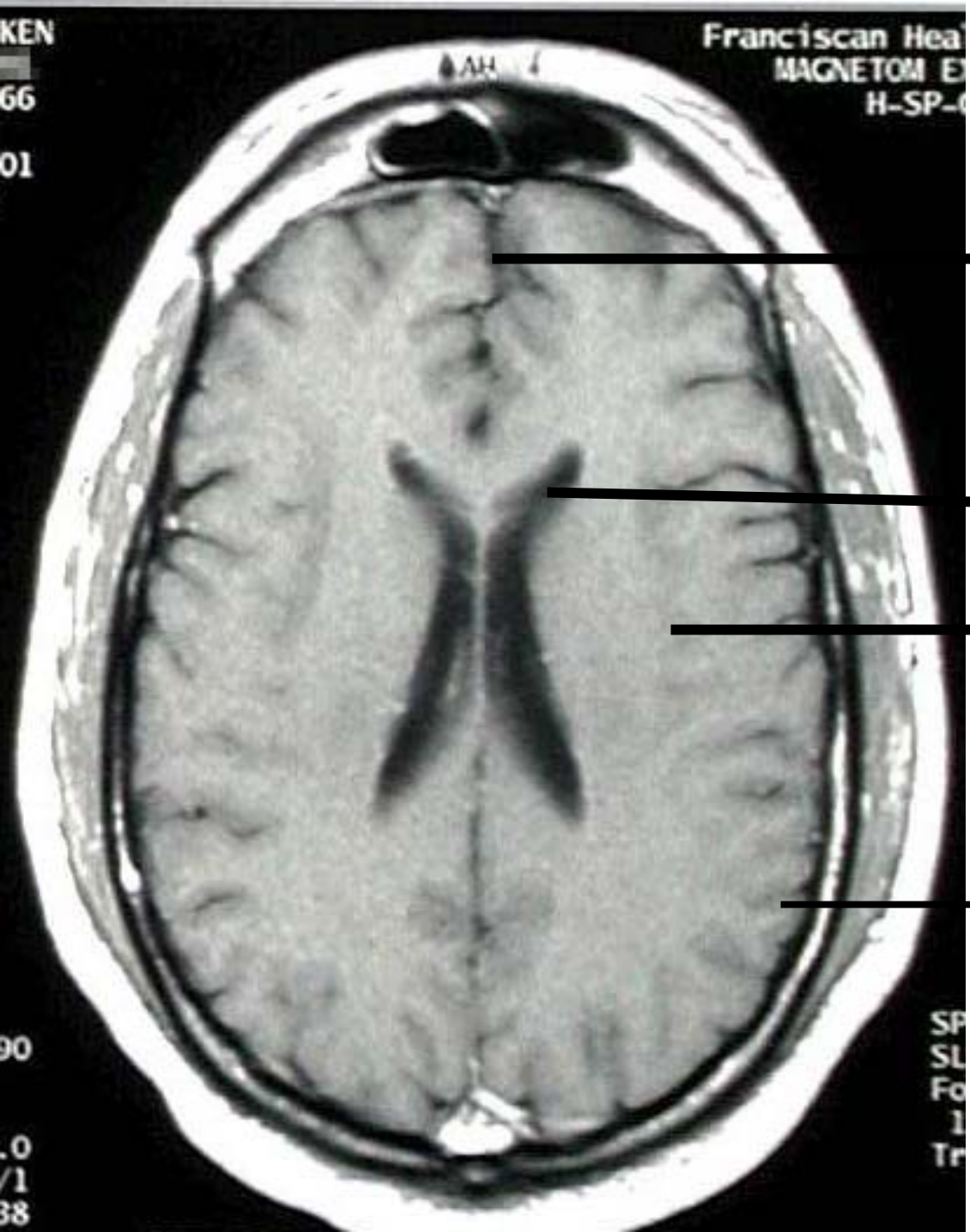
4
wernicke's area
broca's area
3
1
2


frontal lobe
motor cortex
sensory cortex
parietal lobe
wernicke's area
broca's area
occipital lobe
temporal lobe
cerebellum
brain stem

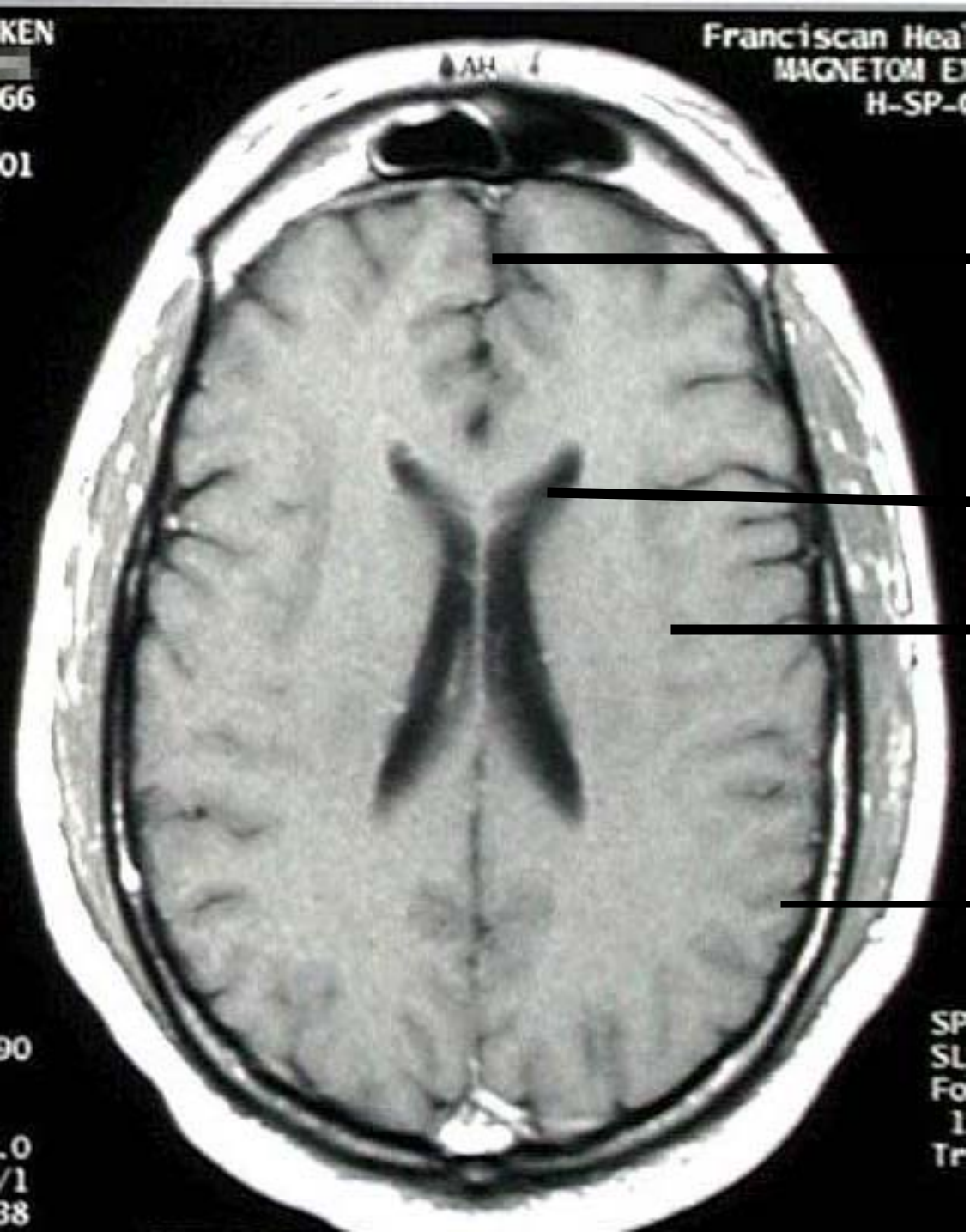


1:

2 lateral ventricle

3

4

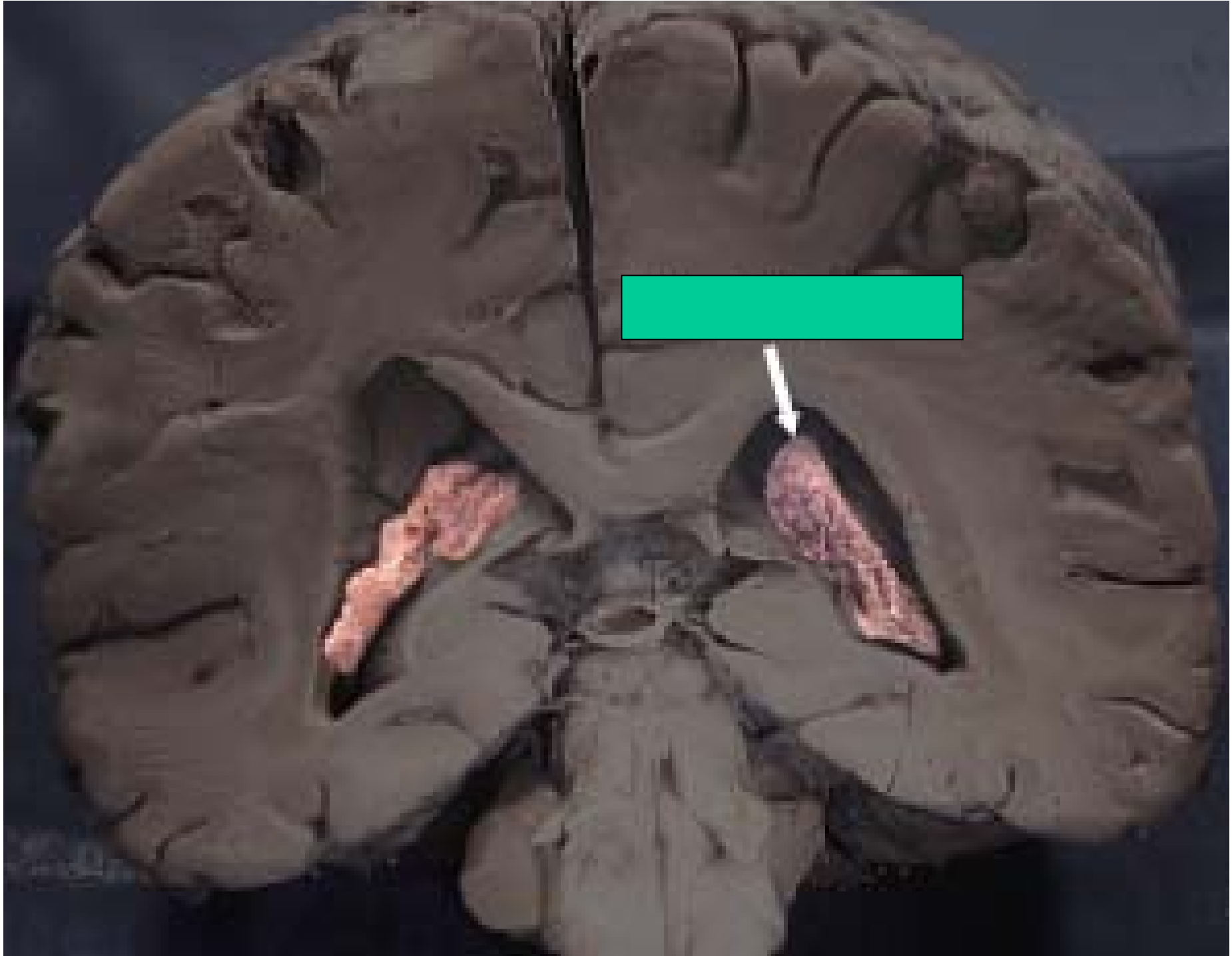


1longitudinal fissure

2 latewral ventricle

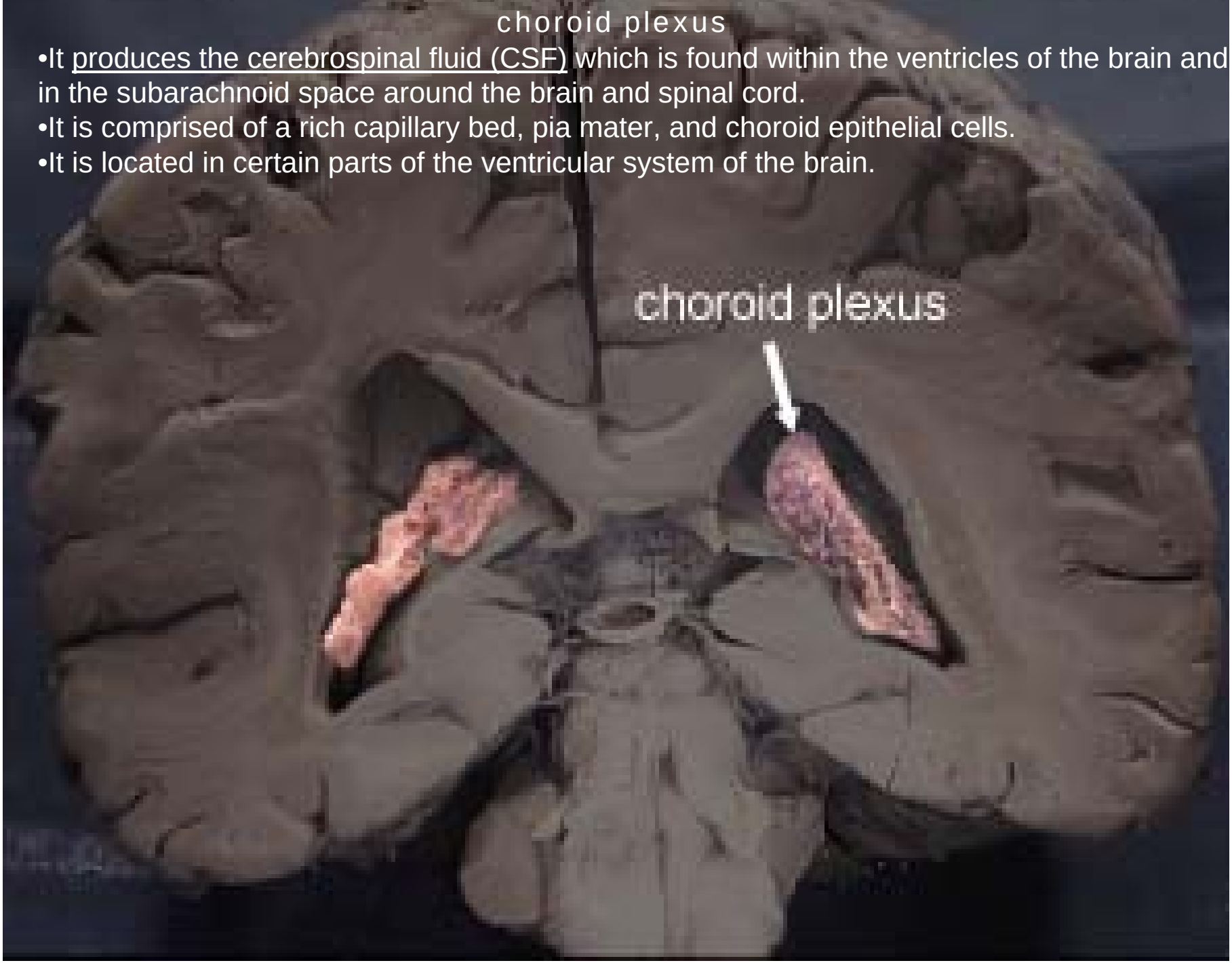
3 insula

4 giry



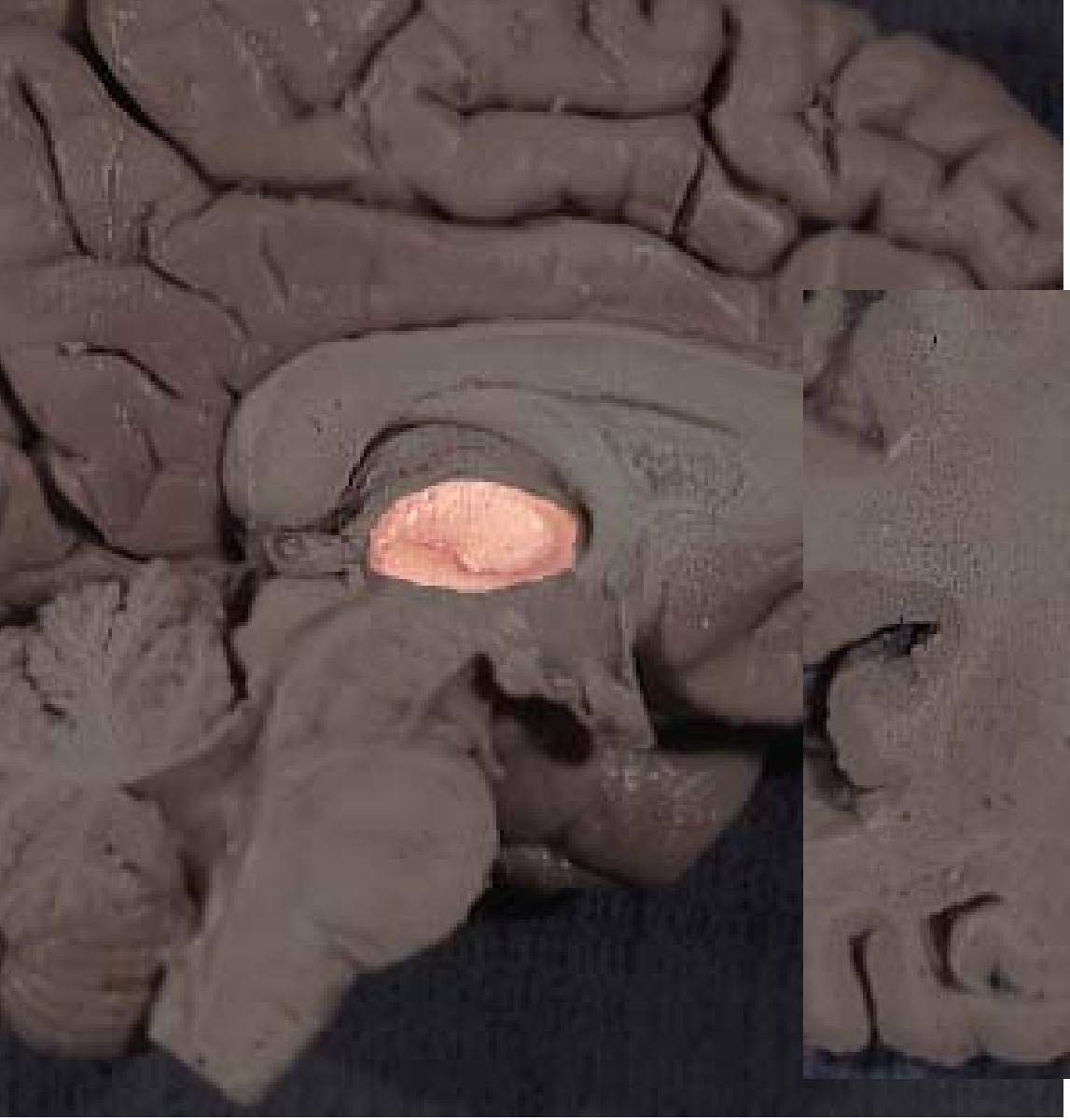
choroid plexus

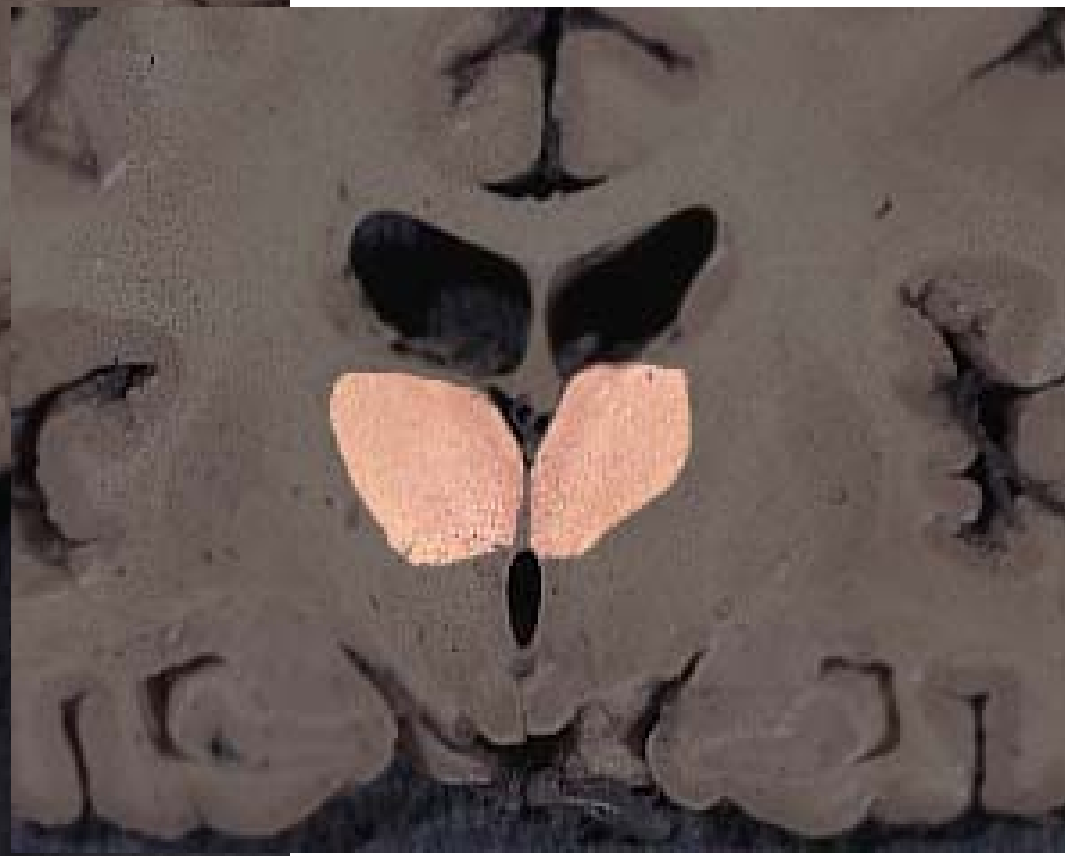
- It produces the cerebrospinal fluid (CSF) which is found within the ventricles of the brain and in the subarachnoid space around the brain and spinal cord.
- It is comprised of a rich capillary bed, pia mater, and choroid epithelial cells.
- It is located in certain parts of the ventricular system of the brain.



cerebellum

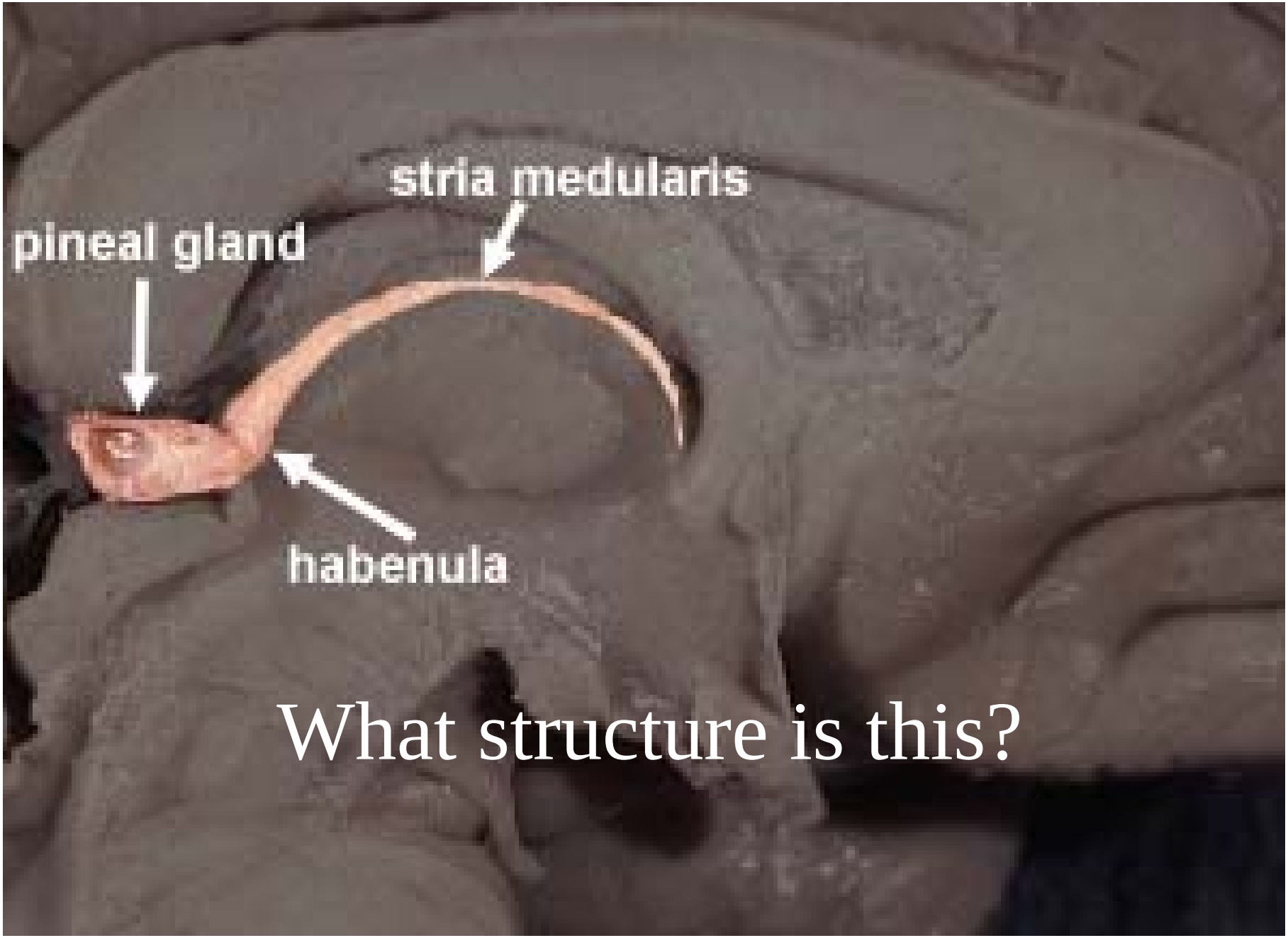
•It is important for coordinating voluntary movements (e.g. walking, posture, speech) and for learning motor (skilled) behaviors.
•The cerebellum, like the cerebrum, has a cortex or outer covering of gray matter. The types/names of neurons and layers in the two cortices differ.





thalamus

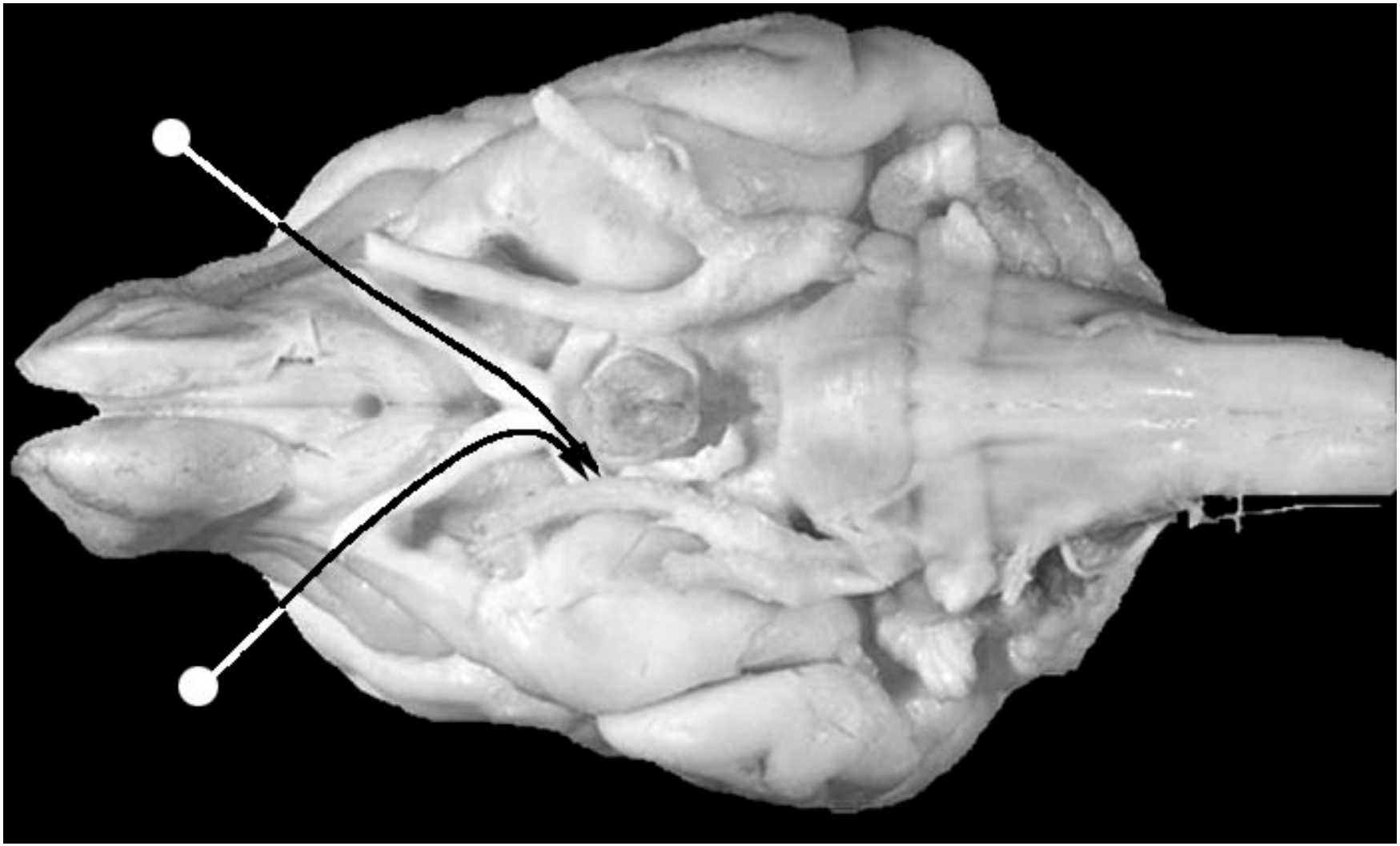
- It *r*elays to the cerebral cortex information received from diverse brain regions. Sort of a requisite 'last pit stop' for information going to cortex.
- Axons from every sensory system (except olfaction) synapse here as the last relay site before the information reaches the cerebral cortex.
- There are other thalamic nuclei that receive input from cerebellar-, basal ganglia- and limbic-related brain regions.



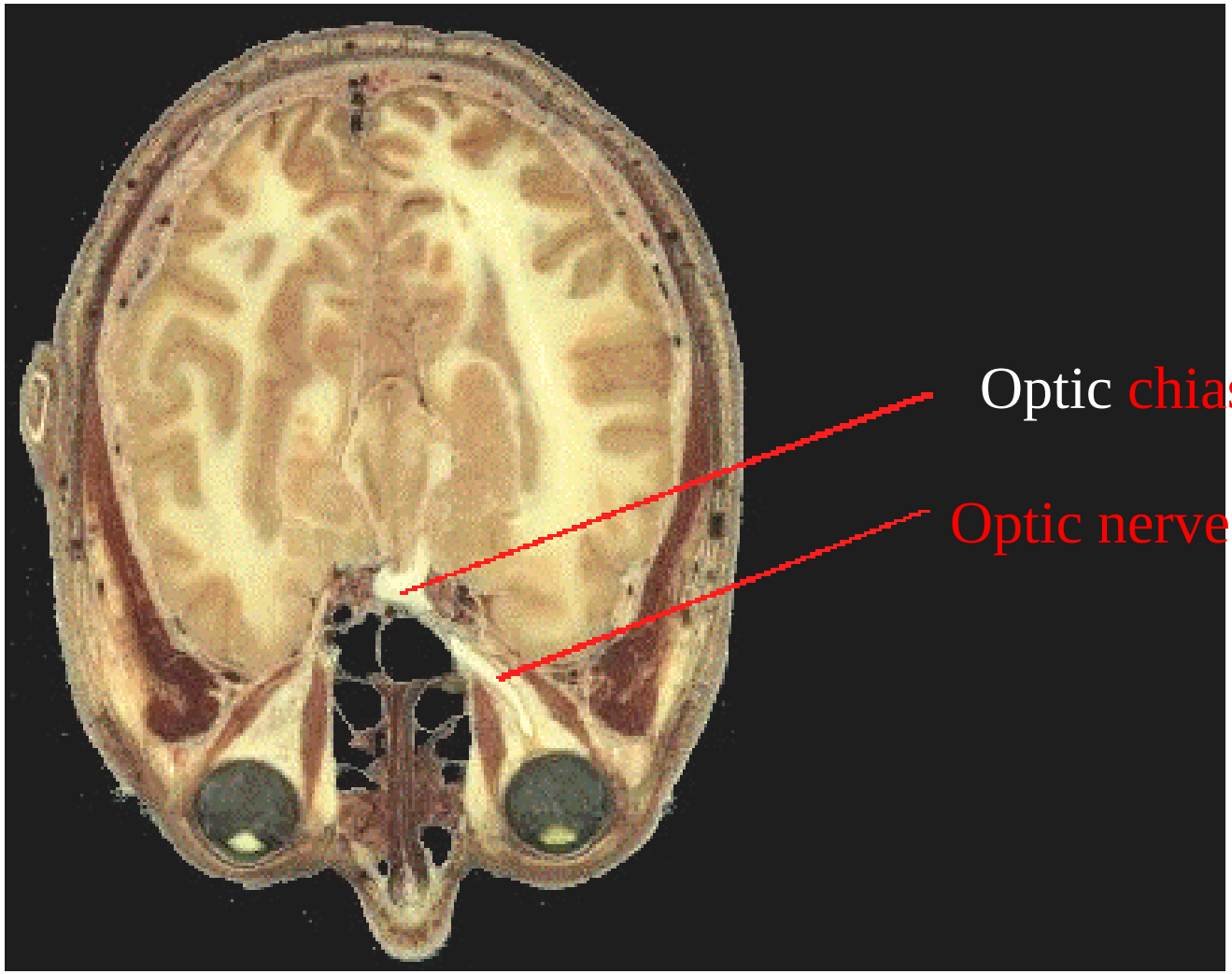
What structure is this?

Epithalamus

•Parts of the epithalamus that are visible in a mid-sagittal view of the gross brain include the **pineal body** or **gland**, the **habenula**, and the **stria medullaris of the thalamus**.
•The pineal body, for example, is responsible for secretion of melatonin which is important in the sleep/wakefulness cycle.
•The habenula is a nucleus that projects to the midbrain and is thought to be important for regulating food and water intake.



Optic nerve



Auditory area. ?

Temporal

Primary sensory cortex.?

Parietal

Somatic motor cortex.

Frontal

Visual area.

Occipital