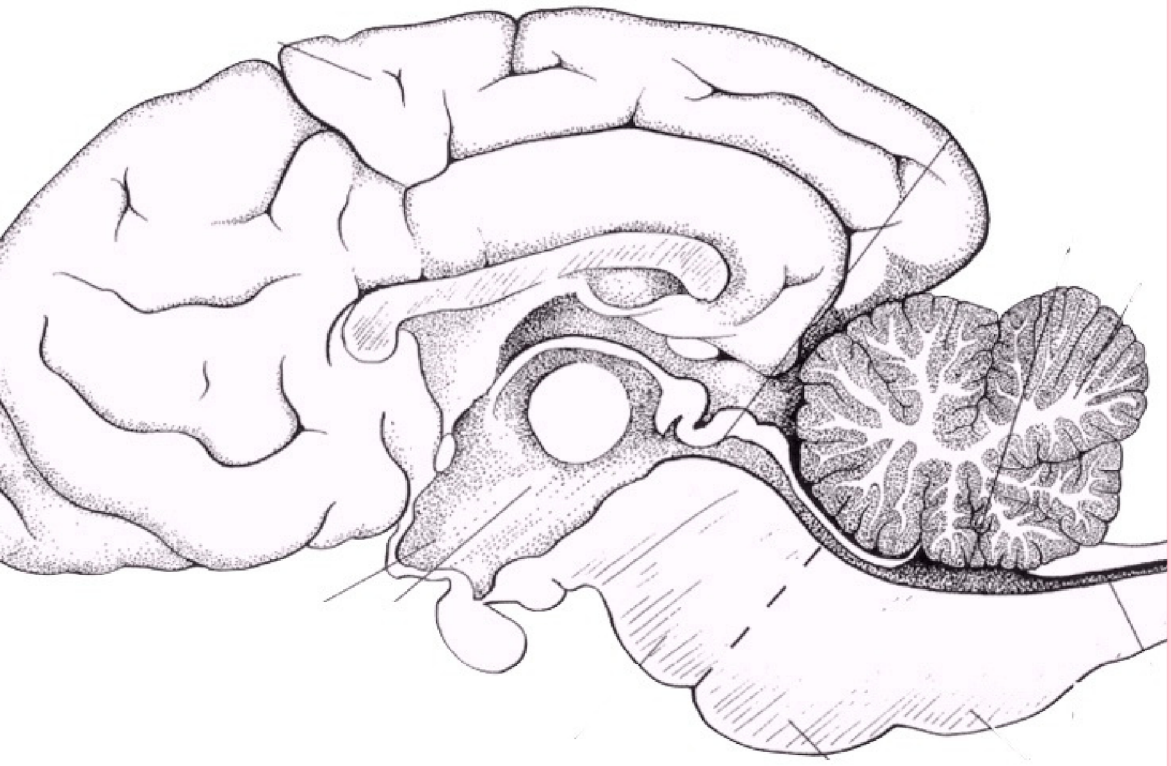
Iowa Neuropathology Resource Laboratory

OCTOBER 2023

# Sheep Brain DISSECTION

*Dissection Guide*



GRADES 9-12

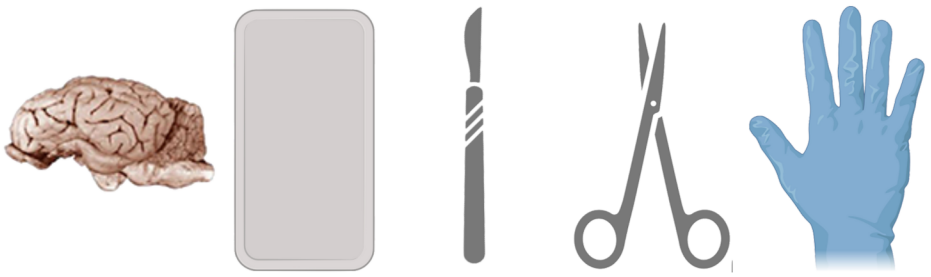
# LABORATORY SAFETY

- **NO food or water in laboratory area** - please leave it at your desk or in your backpacks. This includes chewing gum! Do not lick or eat the specimen being dissected.
- Always read the lab manual before beginning, prepare yourself for what instruments and techniques will be used.
- Please use the common sense rule when working with sharp instruments such as the scalpel. Additionally, please be respectful to the brains, as well as your lab members!
- Be sure to wear gloves at all times when dissecting or examining tissue. Avoid touching clean surfaces or other individuals with contaminated gloves.
- Waste products/remains from dissection are to be disposed of as instructed by your teacher. Remember, not everything is safe to rinse down the sink or throw away in the bin.

# SCALPEL USE SAFETY

- Scalpels are **EXTREMELY SHARP!**
- **ALWAYS** be aware of where the scalpel is located at your lab bench to avoid accidents.
- Grab the scalpel by the handle, **NEVER** by the blade end.
- When working in groups, avoid reaching over each other. Walk around or ask politely to move.
- Avoid cutting directly toward your body (or others) - make sure your fingers are **OUT OF THE WAY**! Ask instrutor to demonstrate proper scalpel mechanics, if needed.
- Reccomended positions to hold a scalpel:

# Materials & Preparation

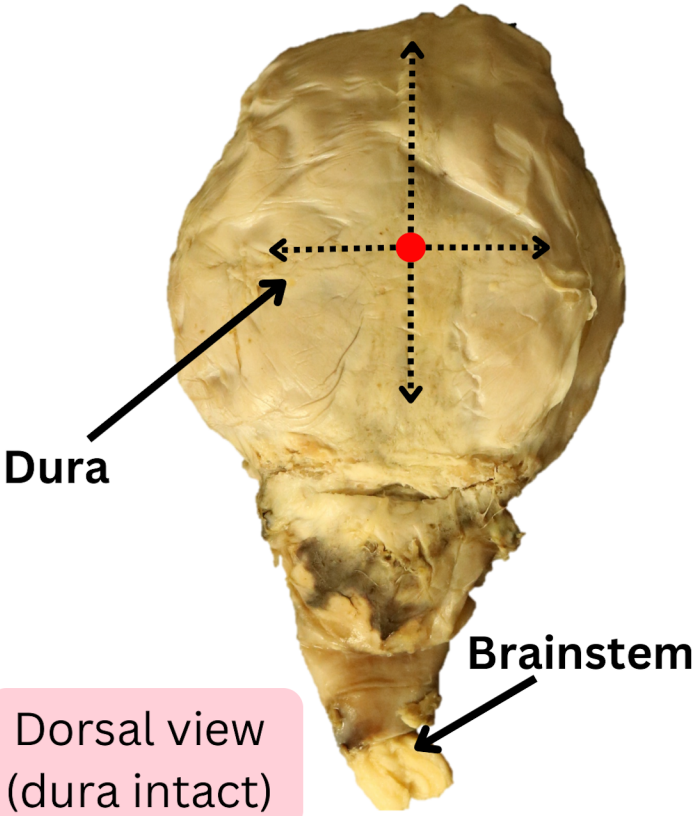


A. B. C. D. E.

A. Sheep brain (with dura)
B. Cutting board
C. Disposable scalpel
D. Dissecting scissors
E. Safety laboratory gloves

1.) Start by reading through the laboratory safety section - familiarize yourself with the instruments and how they should/should not be used.
2.) Read through the dissection manual to get an understanding before you begin the dissection.
   - Familiarize yourself with the brain anatomy and orientation terms used to specify the location and relative location of brain structures.
3.) Make sure you (and lab members) are wearing the proper personal protective equipment (PPE) designated by your lab manual.
4.) Gather all materials (if not already distributed), and organize your lab bench. Lay out your instruments ready for use.

# Dura Removal




Dorsal view (dura intact)

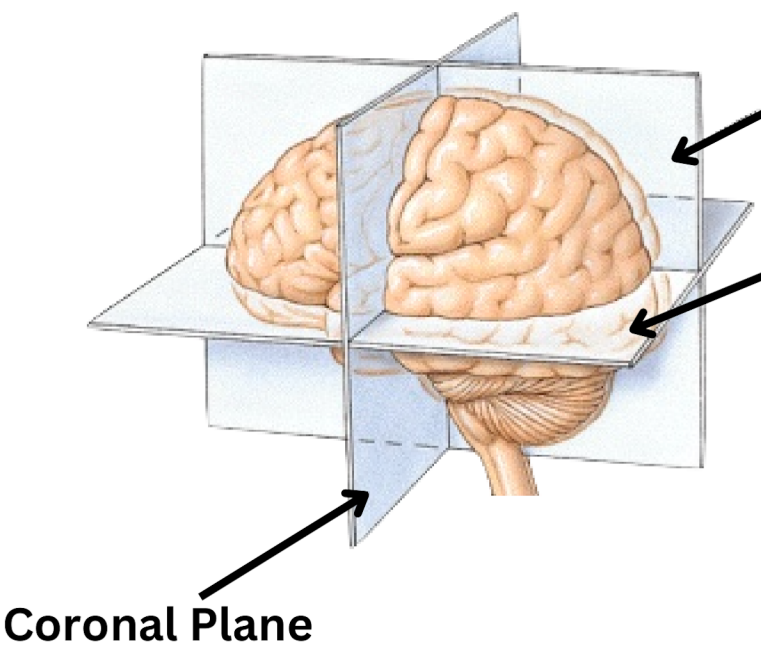
1.) Locate the longitudinal fissure depression, insert the tip of one of the blades or the dissecting scissors in the middle of the fissure (red dot).

2.) Begin cutting following the black dotted arrow in diagram (to the left). Make sure you are cutting above the cortex and are only cutting the dura!

3.) Peel back the dura sections to reveal the cortex of the brain.

*Instructor can help with dura removal*

# *Directional Terms & Anatomical Planes*




Helpful ways to remember anatomical planes:

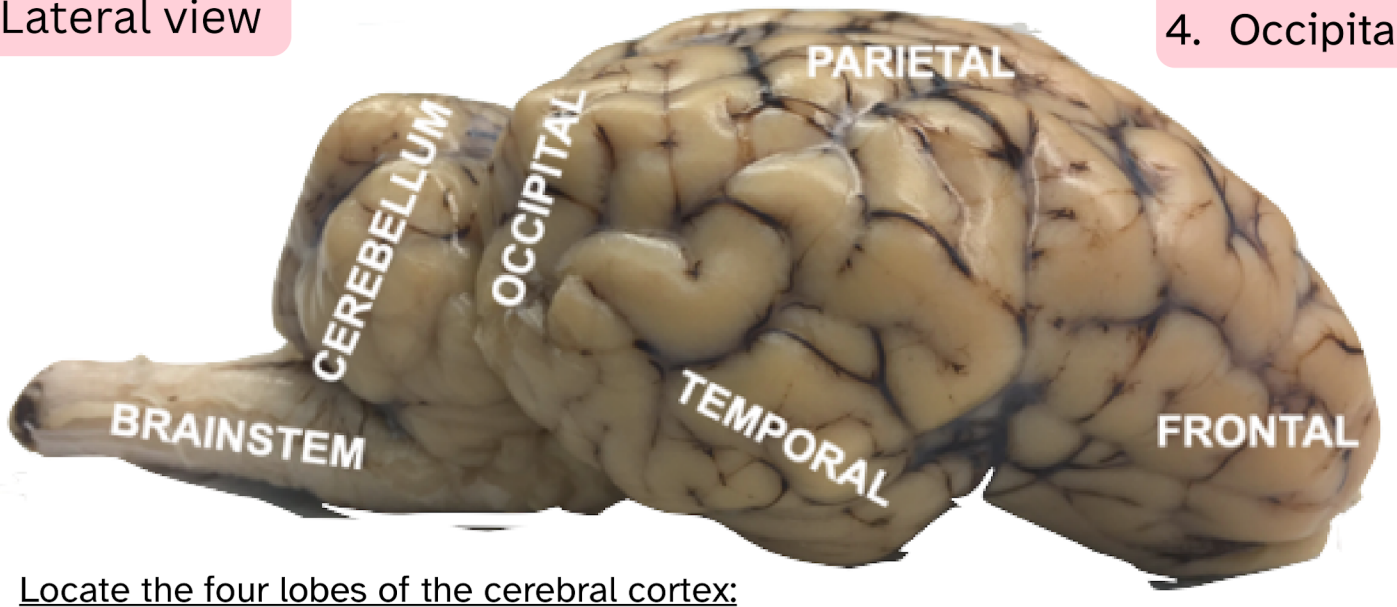
- Sagittal = side view
- Horizontal = horizon
- Coronal = crown

| Key Anatomical Directional Terms (in central nervous system): | |
|---|---|
| Anterior | Front |
| Posterior | Rear, behind |
| Distal | Away from, farther from the origin |
| Proximal | Near, closer to the origin |
| Dorsal | Near the upper surface, top |
| Ventral | Toward the bottom |
| Superior | Above |
| Inferior | Below |
| Lateral | Toward the sides, away from midline |
| Medial | Toward the midline, toward the middle |
| Rostral | Toward the front |
| Caudal | Toward the back |

# *Anatomy & Orientation*

**Four Lobes:**
1. Frontal
2. Parietal
3. Temporal
4. Occipital

Lateral view



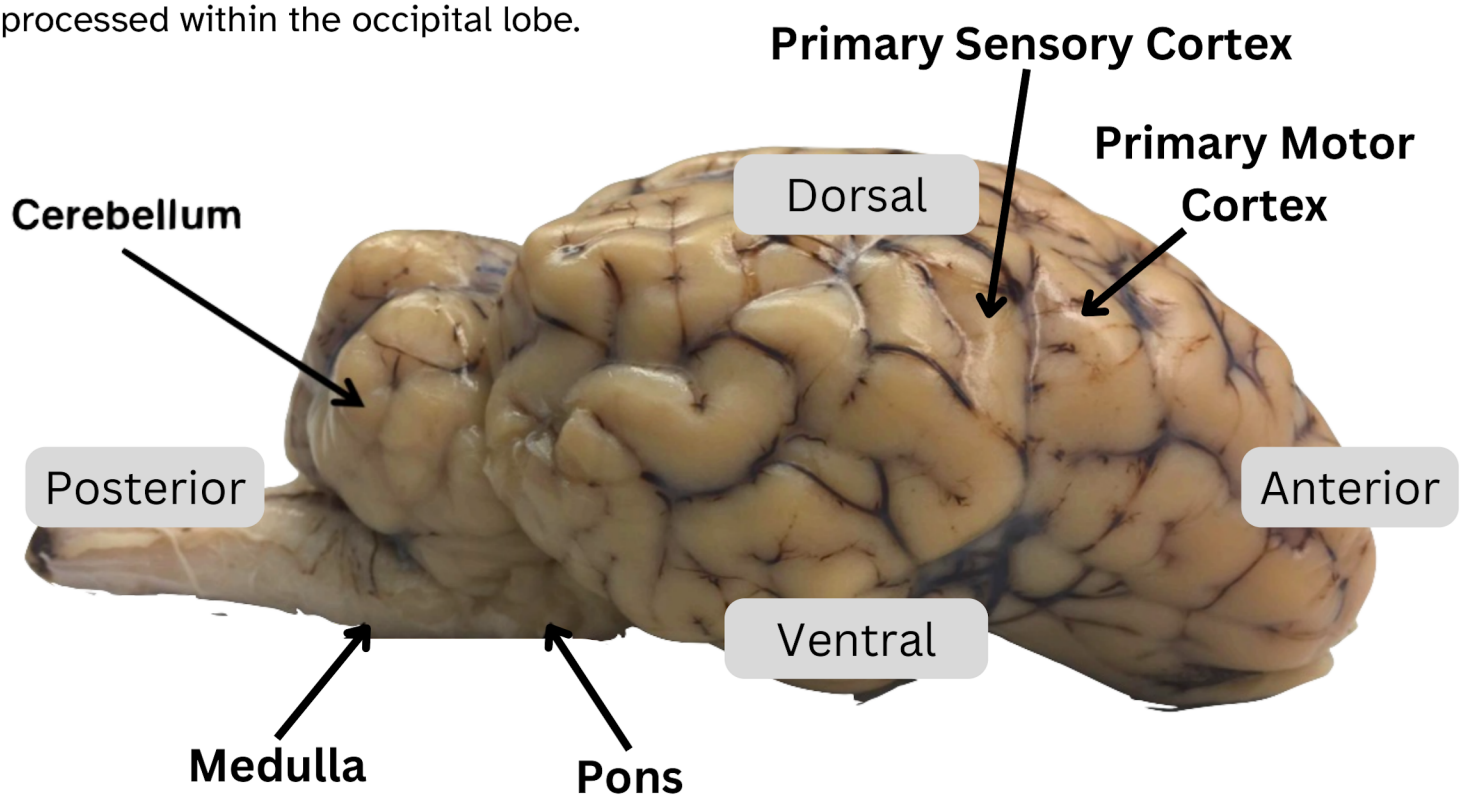

Locate the four lobes of the cerebral cortex:

**The Frontal Lobe:** is primarily responsible for higher level cognitive processes like executive function, memory, and language. The frontal lobe also contains the **primary motor cortex**.

**The Parietal Lobe:** processes somatosensory information such as sight, smell, touch, pain, temperature detection, and even joint positioning. The parietal lobe also contains the **primary sensory cortex**.

**The Temporal Lobe:** contains auditory processing areas which interpret various auditory stimuli from the outside world. The temporal lobe also encodes long term memories.

**The Occipital Lobe:** contains major visual processing areas where information from the outside world travel in through the retinas of the eye, into the optic nerve, and are processed within the occipital lobe.

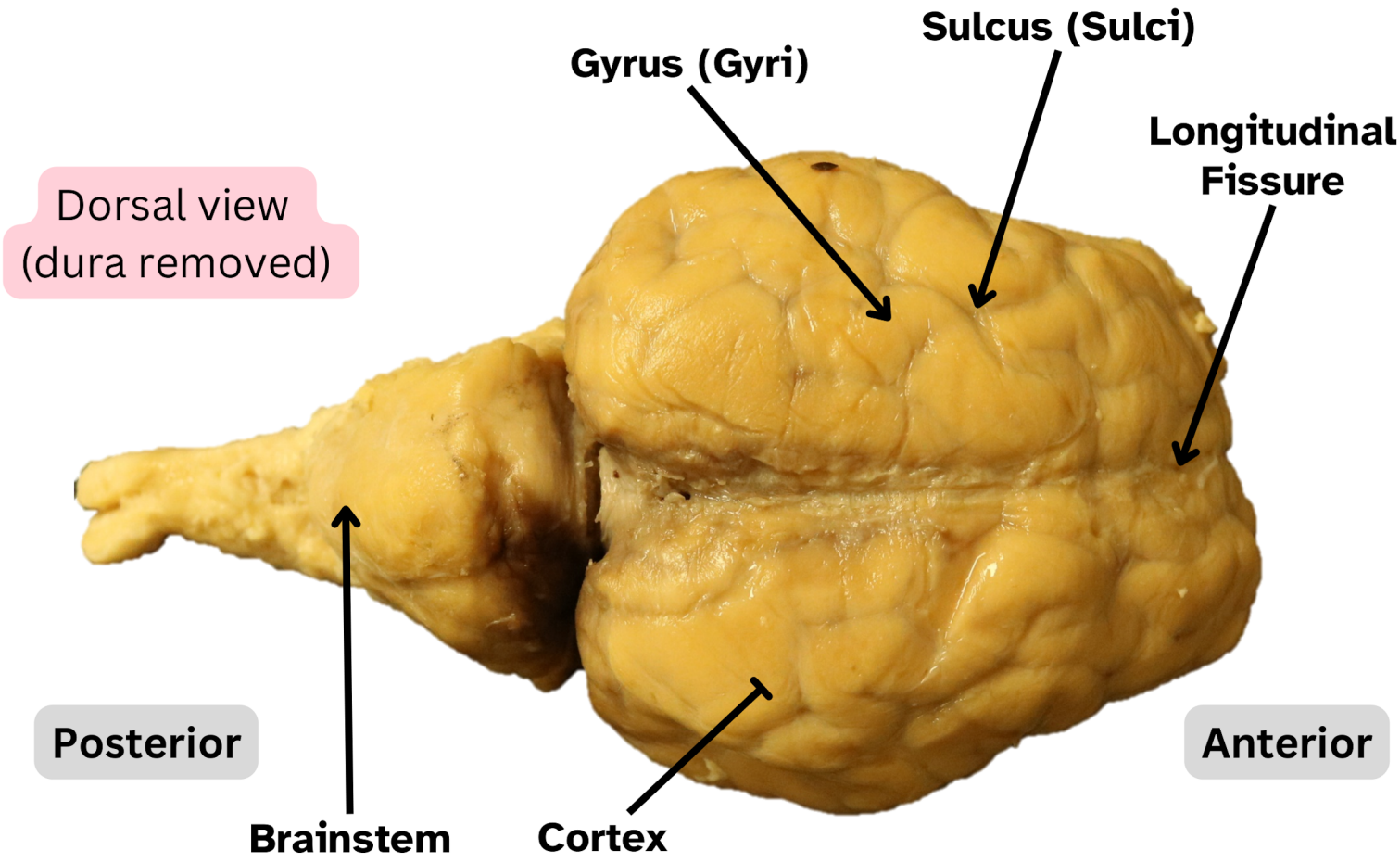


# *Dorsal View*

The **dura mater**, dura for short, is one of the layers of connective tissue that make up the meninges of the brain and aids in protection. The dura mater is the toughest layer of the meninges.
The pia mater, another layer of the meninges, is the thin membrane that adheres tightly to the surface of the brain, dipping into each sulcus.
The arachnoid, another layer of the meninges, is an ultra-thin spongy layer that is difficult to see without a microscope. You will not be able to see the pia or arachnoid mater on the sheep model, but you would in humans.

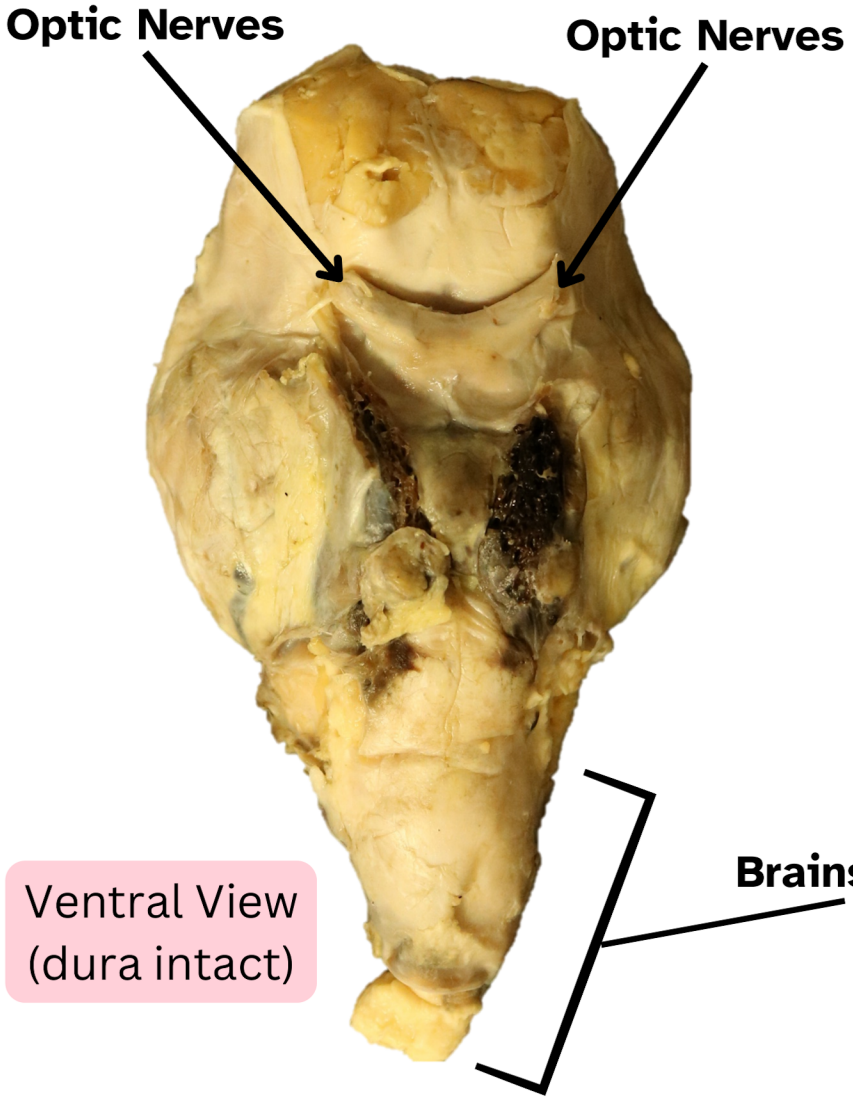
The largest structure in the dorsal view is the **cerebral cortex (cortex).** The cortex is folded upon itself, creating **gyri** (sg. gyrus - look like hills) and **sulci** (sg. sulcus - looks like valleys)

1. Locate the **longitudinal fissure** or indention that runs laterally between the right and left cerebral hemispheres.
2. Before dissecting, try identifying external brain regions:
    - **Primary lobes (frontal, parietal, temporal, occipital)**
    - **Longitudinal Fissure**
    - **Sulci and gyri**
    - **Cerebellum**
    - **Brainstem (pons, medulla, spinal cord)**

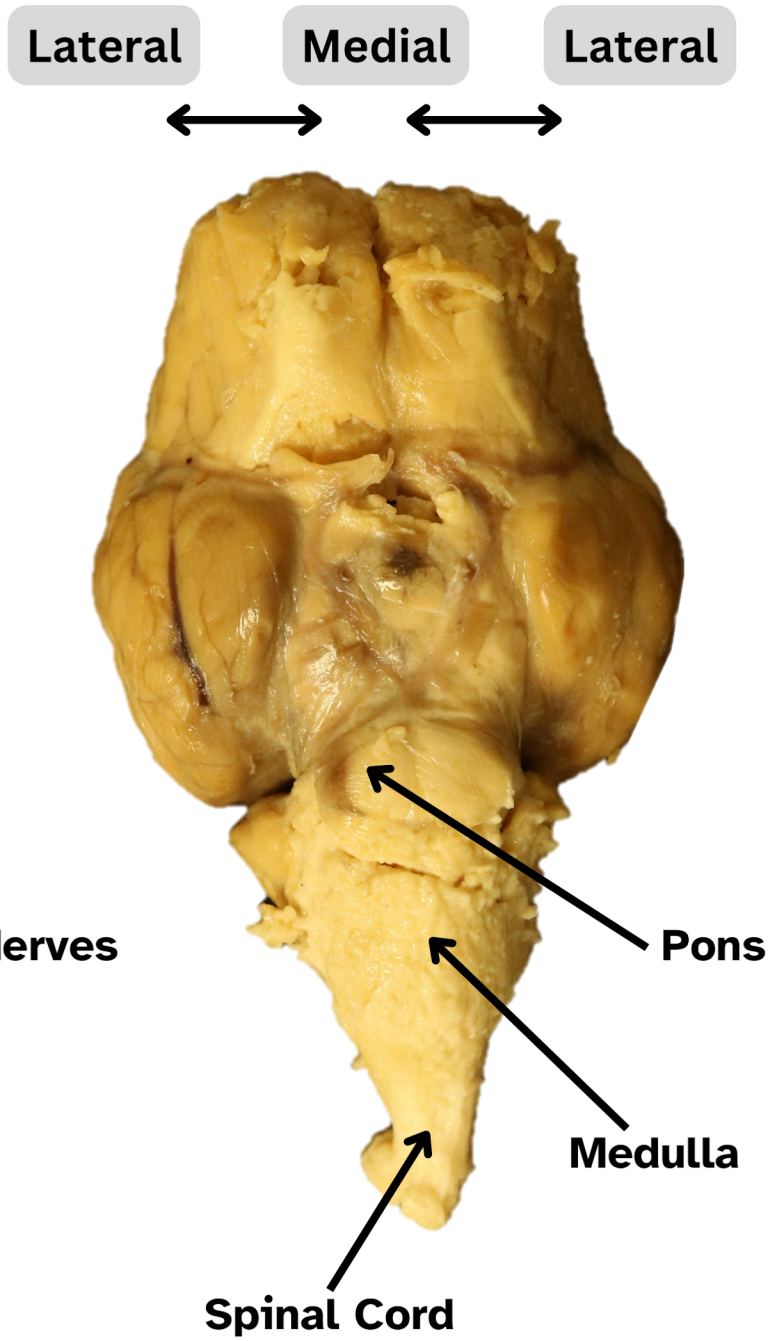


# *Ventral View*

1. Identify the optic nerve tracts. The optic nerve is 1 out of 12 cranial nerves. Most likely not all 12 nerve tracts will be visible in the specimen.
2. While viewing the ventral surface try to locate the following:
   a. **Pons:** relays information to cerebellum, regulates breathing and sleep cycles.
   b. **Medulla Oblongata:** where brain and spinal cord connect, helps control heart rate, blood pressure, and breathing.
   c. **Spinal cord:** carries nerve signals, sends sensory info from body to brain, motor commands from brain to body, and helps coordinate reflexes.

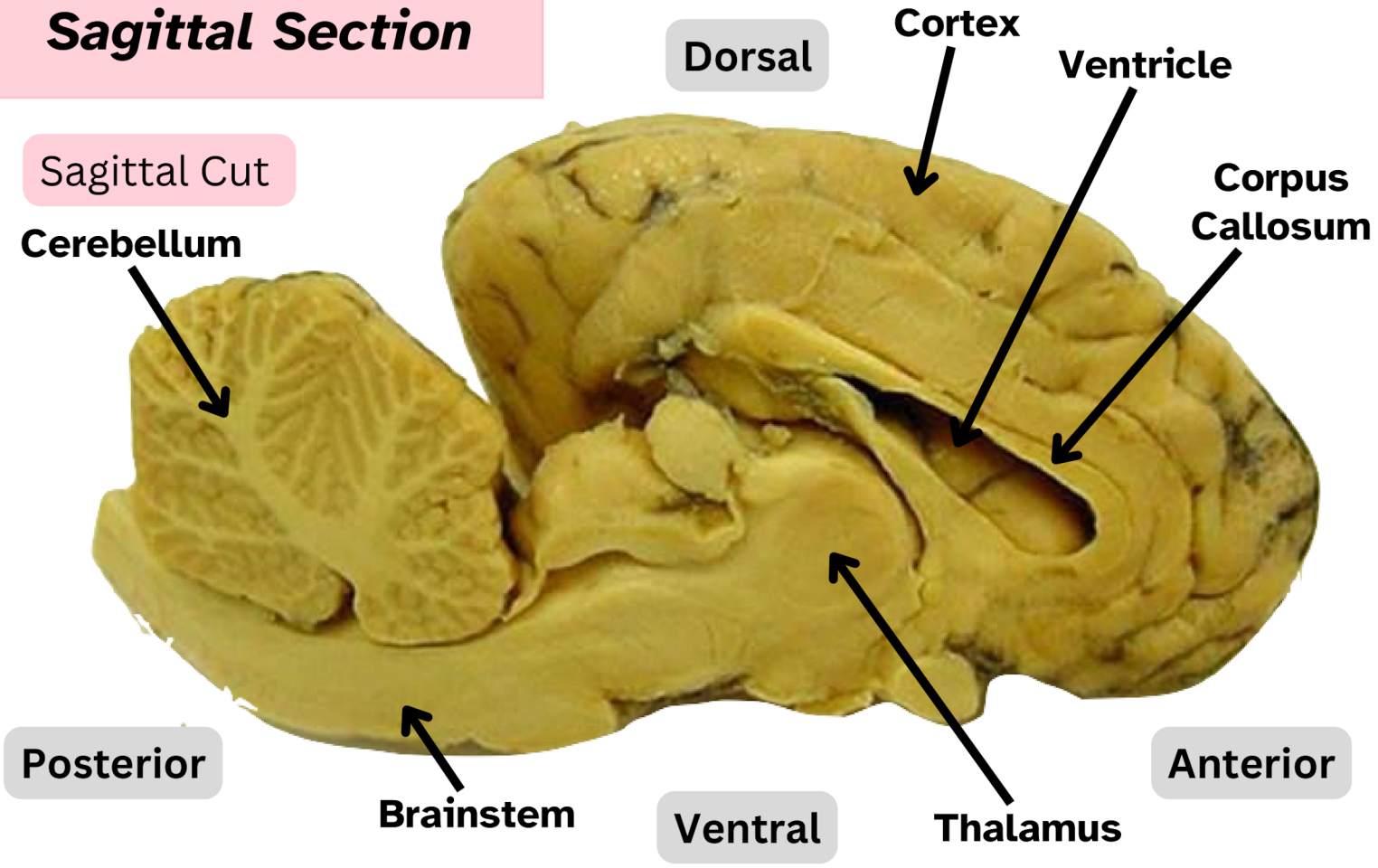



Ventral View (dura intact)




Ventral view (dura removed)

# *Sagittal Section*




## Making Sagittal Sections:

1. Locate the **longitudinal fissure**, the sulcus that divides the right and left cerebral hemispheres.
2. Gently pull on the two hemispheres of the cortex, and look down the longitudinal cavity. You will see tissue connecting one hemisphere to the other. This is the **corpus callosum**, the main relay for information passing from one hemisphere to the other.
3. Try to cut with one smooth slice, using enough pressure to cut with one smooth pass of the blade - avoid applying too much pressure so to not break the scalpel.
4. Using your scalpel, carefully cut the brain along the longitudinal fissure, severing the corpus callosum and halving the brain and brainstem.

Once the sagittal cut has been made identify the following regions visible in this midsagittal view:

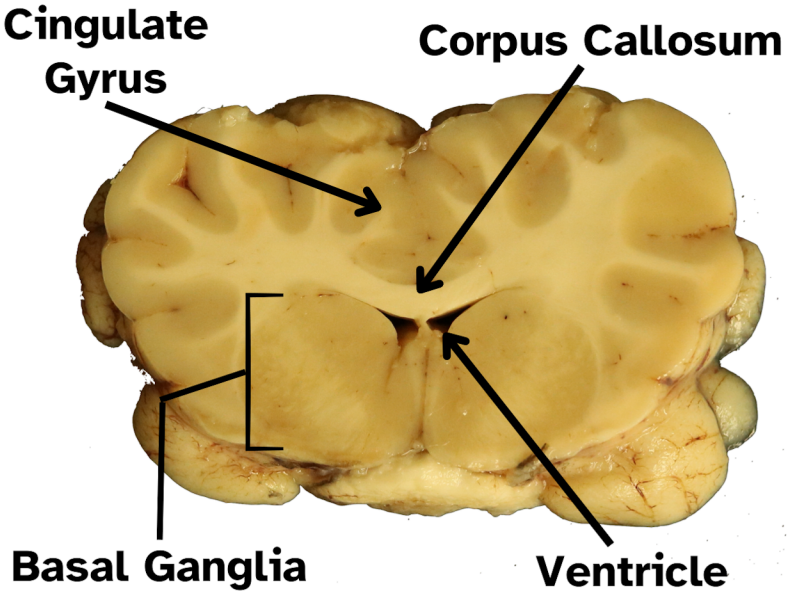
**a. Cortex**
**b. Corpus Callous**
**c. Thalamus**
**d. Cerebellum**

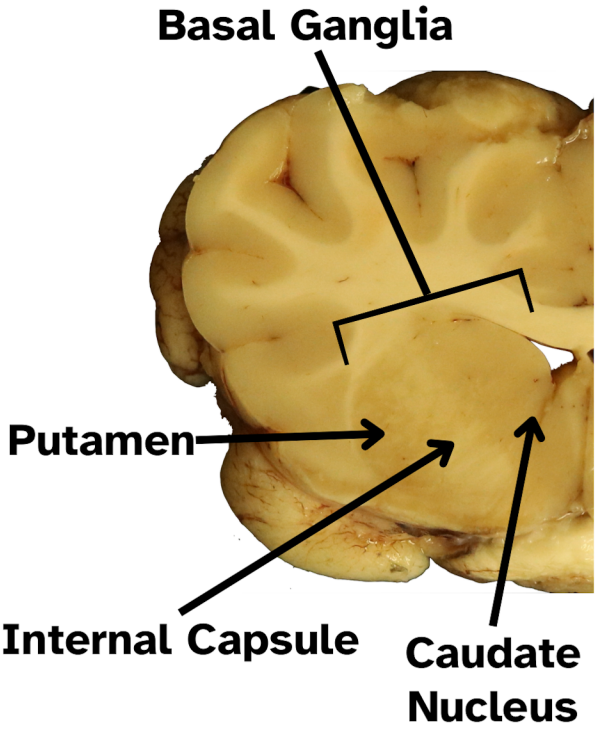
Once the sheep brain has been sectioned sagittally, divide your lab group into two even groups.
Each group will be dissecting one hemisphere from this point on.

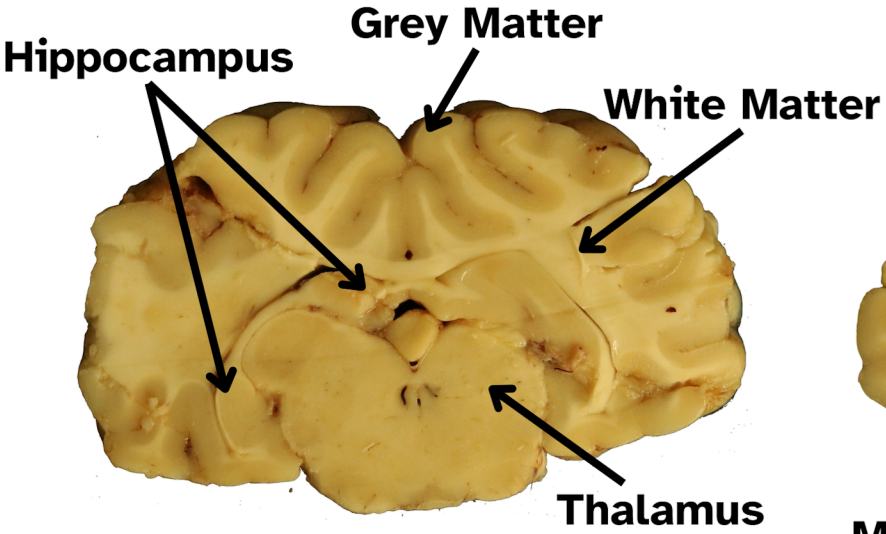
# *Coronal Sectioning*

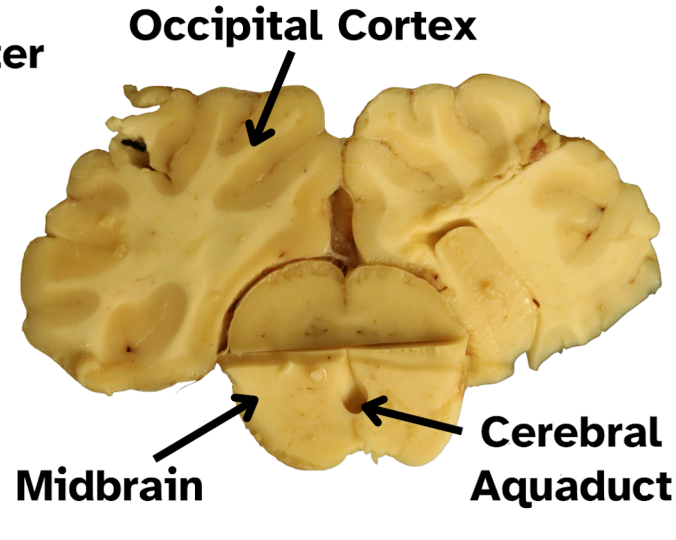
## Making Coronal Sections:

1. Carefully, trying to hold your scalpel as level as possible make a series of coronal sections, about 0.5 to 1 cm in width, through the entire hemisphere (about 10-12 sections). Lay these in anatomical order, **posterior side up**.
2. Identify any brain regions you are able to see:
   a. **White and grey matter:** white matter = myelinated (fatty insulation) axons, grey matter = neural cell bodies.
   b. **Cingulate gyrus:** aids in pain and emotion regulation.
   c. **Basal ganglia (Caudate, Putamen, and the Internal Capsule):** a group of subcortical nuclei responsible for voluntary motor control and learning, executive functioning behaviors, as well as emotions.
   d. **Thalamus:** main relay station for sensory and motor information.
   e. **Hippocampus:** plays role in formation and retrieval of short-term and long-term memories.
   f. **Brain stem (midbrain, pons, medulla)**
   g. **Corpus Callosum**



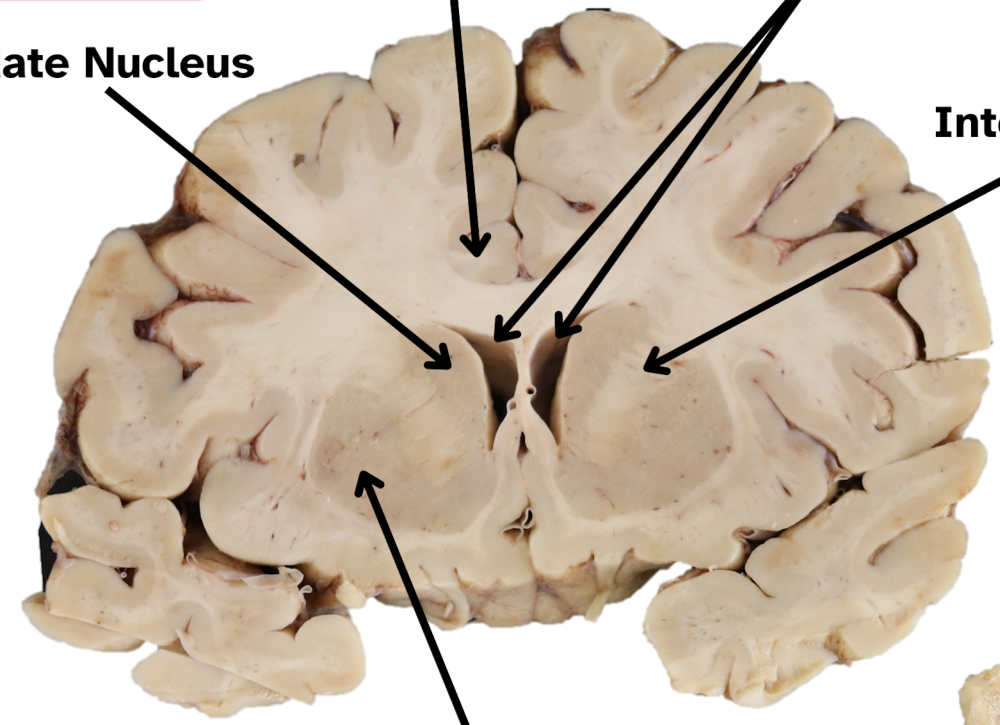



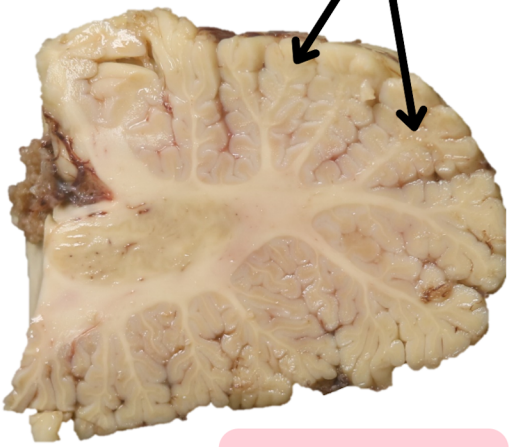



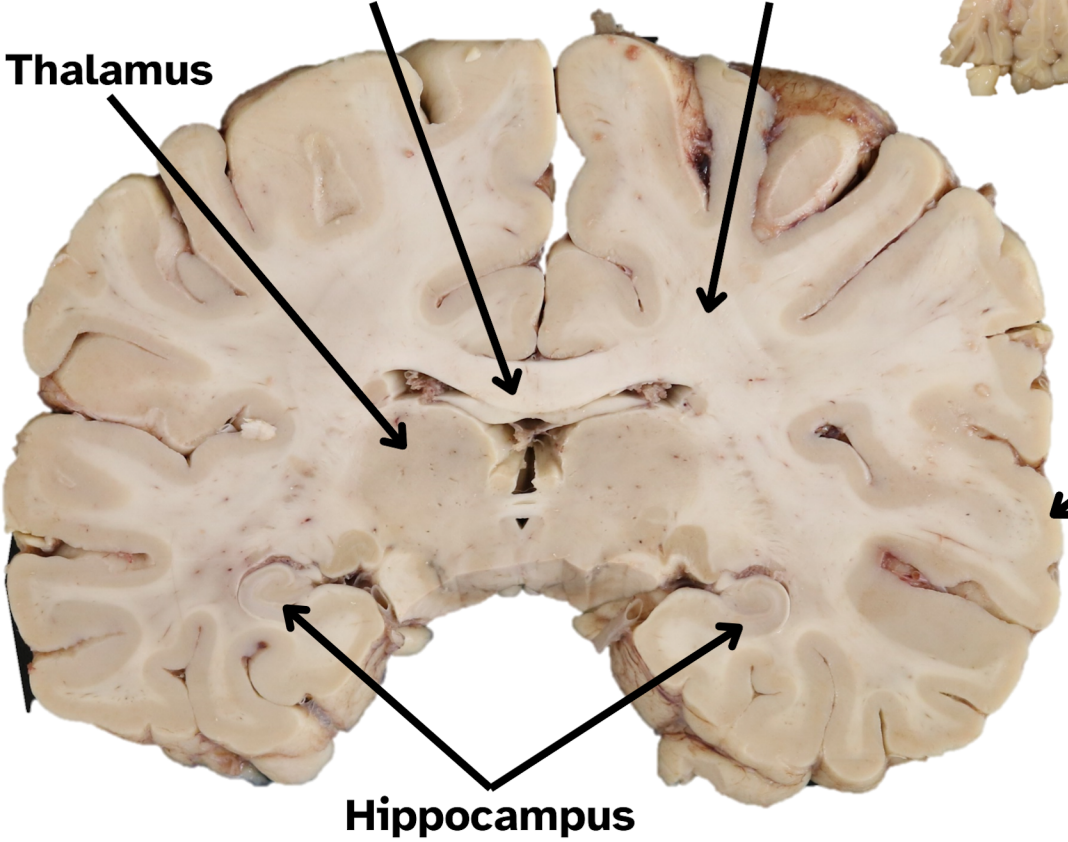
# *Human Brain Comparison*

Coronal Cut




Cerebellum



# *References*


## Page 4 Anatomical Planes

https://quizlet.com/357457009/planes-of-the-brain-cds-470-diagram/

## Page 8 Sagittal Section

https://www.sdmesa.edu/_resources/images/ldp-gallery/.private_ldp/a592/production/master/8901cf30-af44-4322-8bb3-78a190386be3.JPG

## Other

https://static1.squarespace.com/static/5b6a1636e2ccd1387c79f575/t/5ff76d0b79c246791383ecd2/1610050858823/Sheep+Brain+Lab+Packet_Honeycutt.pdf

https://www.muncysd.org/cms/lib/PA06000076/Centricity/Domain/328/Neuroanatomy%20site%202.pdf