Devon Healthcare Hub

Basic Brain Dissection Manual

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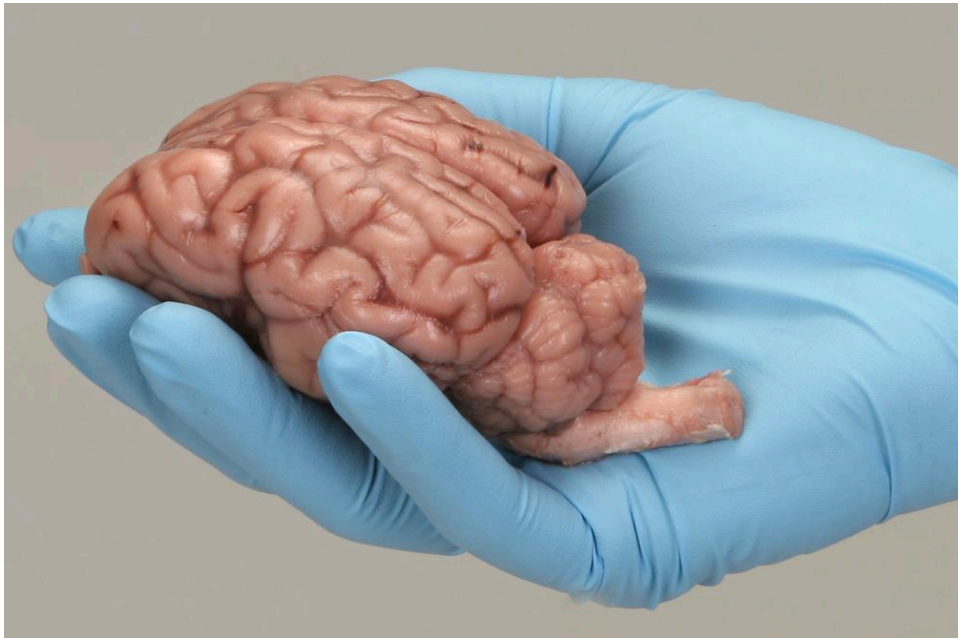


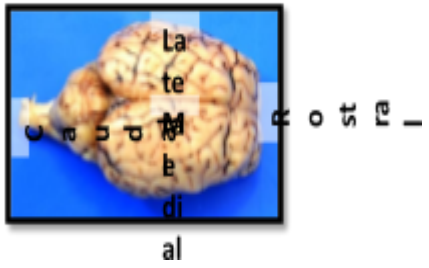
https://m.carolina.com/teacher-resources/Interactive/sheep-brain-dissection/tr49402.tr

1. Introduction

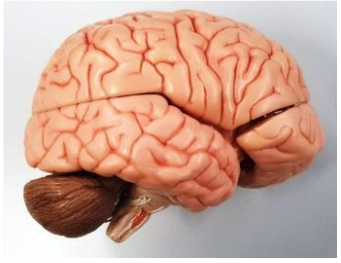
The human brain plays a pivotal role in cognition, maintaining consciousness and processing memories.

Although there are some differences, the sheep brain shows many striking structural anatomical similarities with the human brain. These comparisons confirm the utility of animal models in researching many neurological conditions and diseases affecting human patients. Furthermore, the experience of locating important structures in the sheep brain will help you understand how structures are related to each other in the human brain: the relative locations are the same.

Throughout this entire dissection manual, the photographs of a sheep brain will have a black border, while photographs of human brains will have a white border as indicated below.



Sheep brain



Human brain

2. Safety Information

1. Do not eat the brains.
2. Do not eat the brains.

3. Do not eat the brains.
4. Please, use gloves and wear a lab coat when handling brains and
5. If you get any brain tissue or fluid in your eyes rinse immediately with the solution at the front of the room.
6. Tell us if you cut yourself.

3. Check List

Make sure you have the following items:

1. A dissection board
2. Slicing knife with a granton edge (blade guard)
3. A probe
4. A pair of forceps
5. A pair of scissors
6. A pair of gloves
7. A sheep brain

The following specimens and models will be brought from the LSRC Rooms:

1. One cream human brain plastinated specimen
2. One cream human brainstem plastinated specimen
3. One half human brain plastinated specimen
4. 11 plastic human brain models

4. Dissection PROTOCOL

This protocol comprises of **Three Stages**: Examinations of the brain's exterior, of a sagittal section, and of two rostral sections.

You will need to obtain a STAMP from your Demonstrator of the preceding stage before obtaining the signature of the next stage.

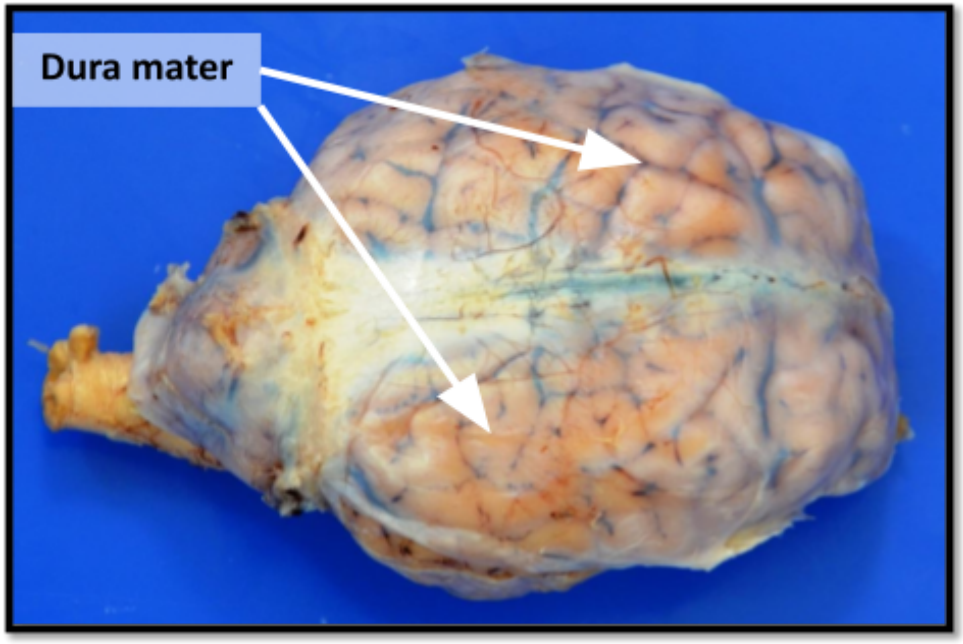
Dissection Stage	Completion STAMP	Demonstrations & Clinical Applications
A. Examination of the Exterior	**No Stamp required**	1. Anatomical Terminology
B. Removal of dura mater	**A1:**	2. Demo: Make an initial sagittal cut on the dura mater. 3. Demo: Cutting off the Tentorium Membrane. 4. Demo: Sparing the 'Smiley' Optic Chiasm. 5. Presentation: Clinical anatomy of the meninges.
C. Brain Lobes & Basic Brainstem identification & Ventral surface identification	**A2:**	6. Presentation: 3D Lobes of the brain Mnemonic 7. Presentation: 3D Brainstem Mnemonic
D. Advanced Brainstem identification	**A3:**	8. Demonstration of the location of the 4th ventricle, cerebellum and superior and inferior colliculi.
E. Examination of a Mid-Sagittal Section	**B:**	9. Demo: Using the slicing knife with a granton edge (blade guard) 10. Presentation: Corpus callosum significance & Kim Peek 11. Presentation: Clinicals of the Ventricular system
F. Examination of Rostral Sections	**C:**	12. Presentation: Alzheimer's Disease

8. Examination of the exterior

During this part of the protocol you will identify the listed anatomical locations on both the sheep brain and the plastic human brain, paying attention to how they are related to other parts of the brain.

1. **Observe the membranes that cover the brain.**

Figure 11: Sheep brain - Superior view of near intact dura mater



The meninges are a protective covering which enclose the brain, and consist of three layers. The most superficial is the dura mater, which is very tough, then the arachnoid mater and finally the pia mater. The space between the arachnoid mater and the pia mater is very important clinically and is called the subarachnoid space. The subarachnoid space contains cerebral arteries that typically cause strokes and the cerebrospinal fluid that provides buoyancy for the brain. Red blood cells within the cerebrospinal fluid are most likely due to the rupturing of cerebral arteries. The pia mater follows the gyri and sulci closely and may be indistinguishable from the brain.

2. Remove the meninges

You will be shown how to do this. Essentially, you will use a pair of scissors to open the meninges following **Figure 12-15** and will then peel the membrane away from the surface of the brain. Although there is relatively little adhesion between the layers you will need to proceed carefully: the brain is soft and easily damaged.

WARNING: Do not puncture the brain with the hidden end of the scissors!

Figure 12: Sheep brain - Dura mater with a slit cut

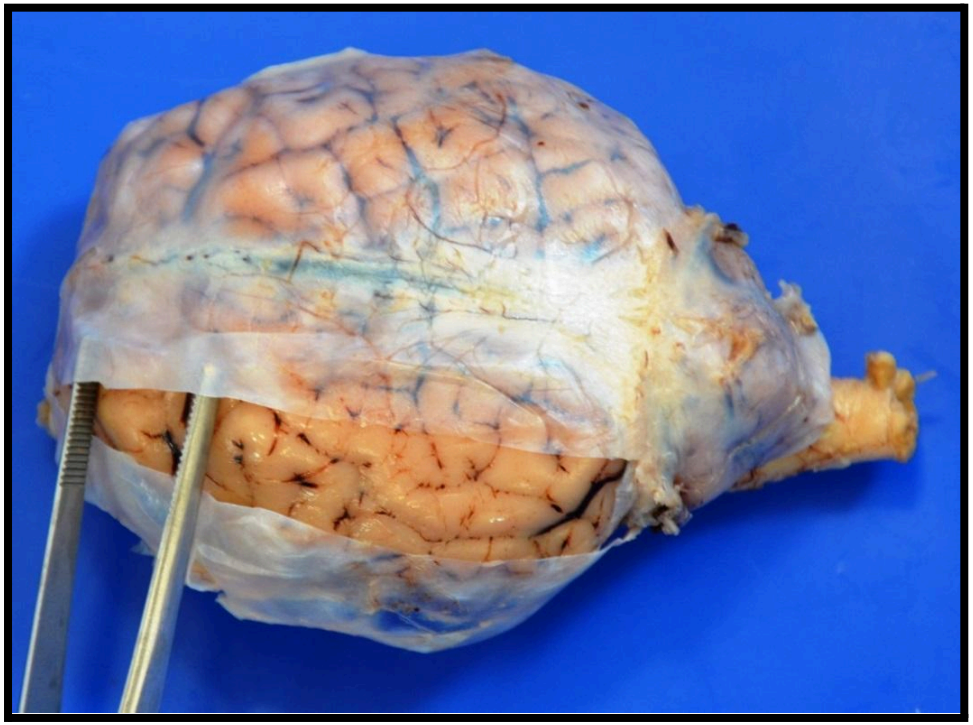


Figure 13: Sheep brain – Further cutting of the mater

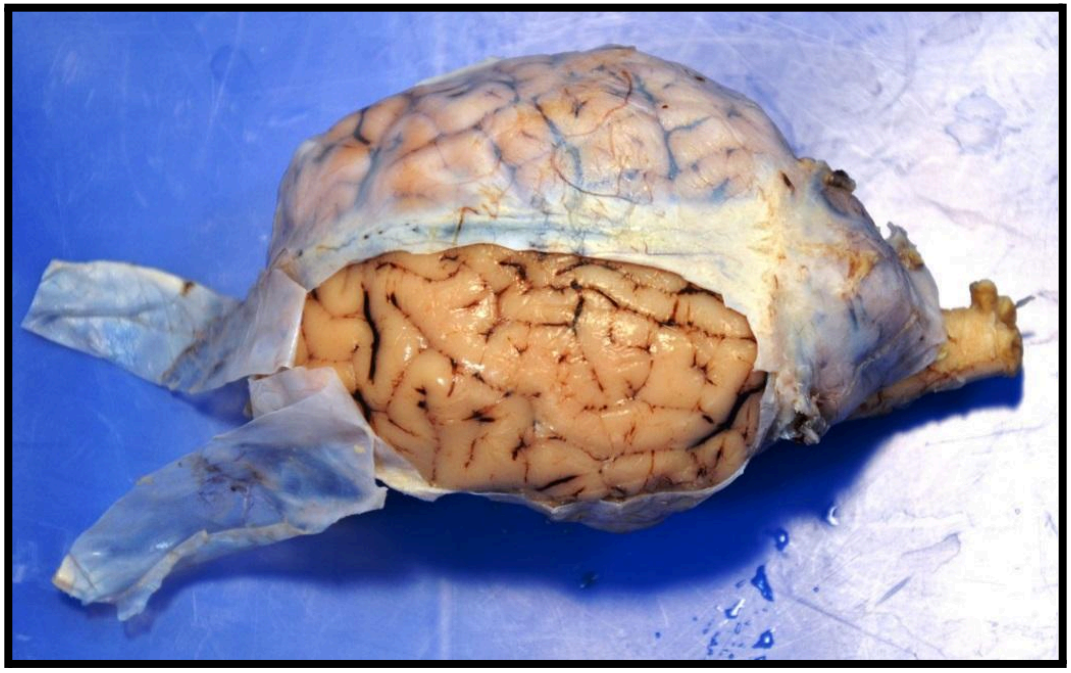
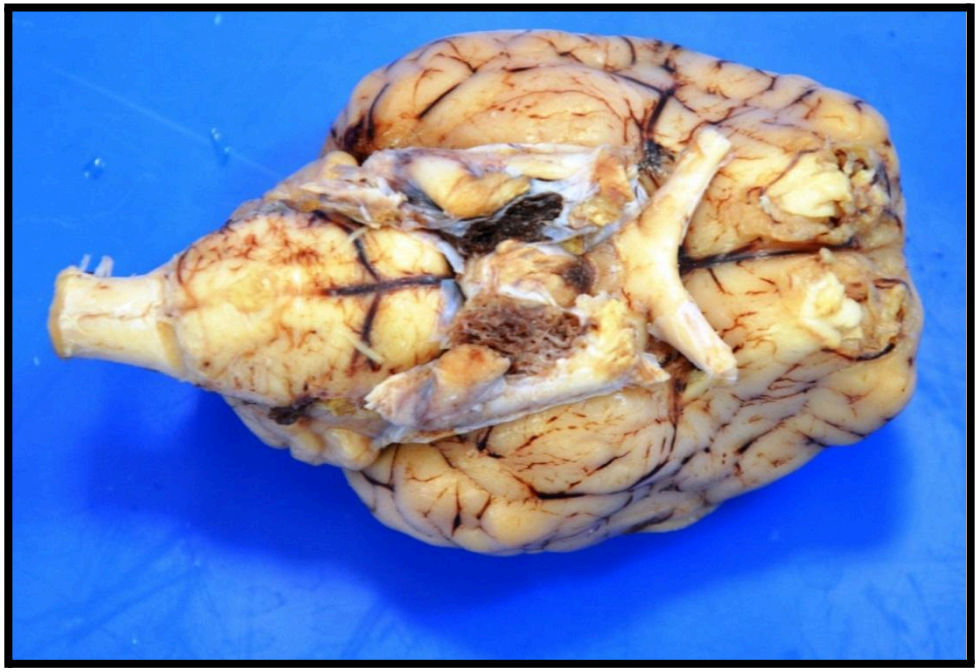


Figure 14: Sheep brain – Further removal of the dura mater

3. **Your removal of the dura mater will end at the stage of Figure 15 indicated below:**



Stamp Tasks:

1. Make an initial sagittal cut on the dura mater.

2. Cutting off the Tentorium Membrane.

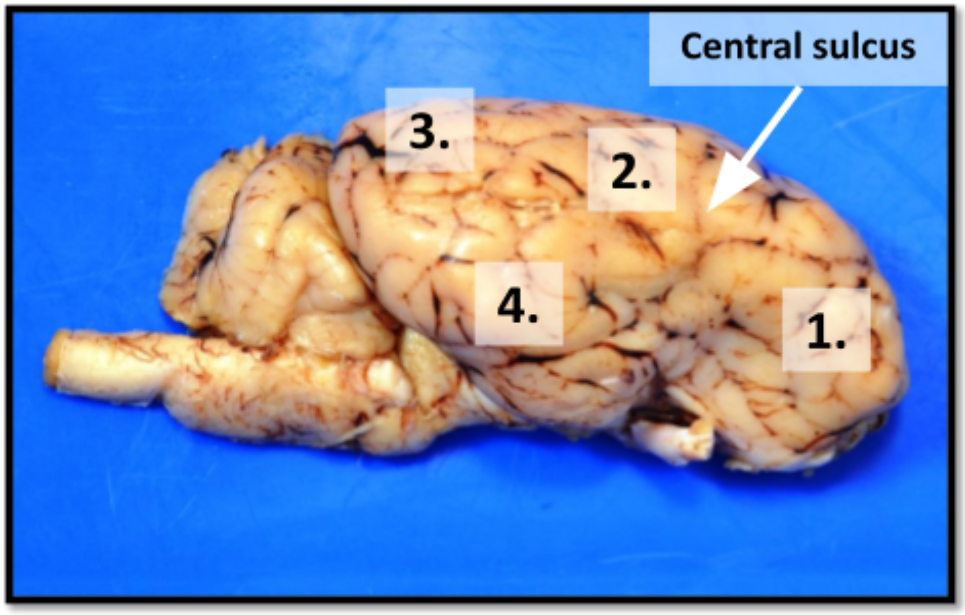
3. Sparing the 'Smiley' Optic Chiasm.

4. The meninges were removed completely and successfully.

A1: Acquire Completion Stamp

4. **Identify the four lobes of the cerebrum: frontal, parietal, temporal, and occipital on your sheep brain and on the human brain model.**

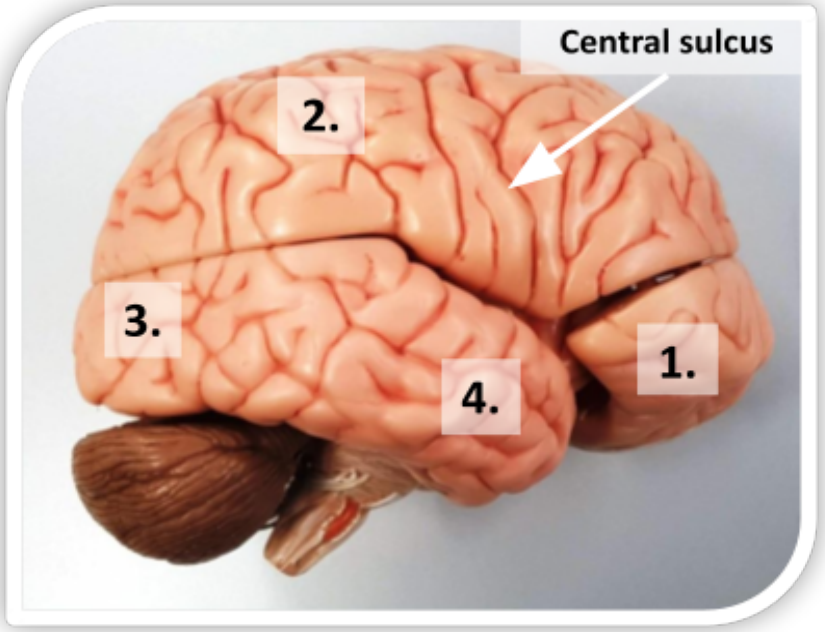
Figure 15: Sheep brain - Lateral view showing the lobes of the brain



Add the labels to the following table:

1. _____
2. _____
3. _____
4. _____

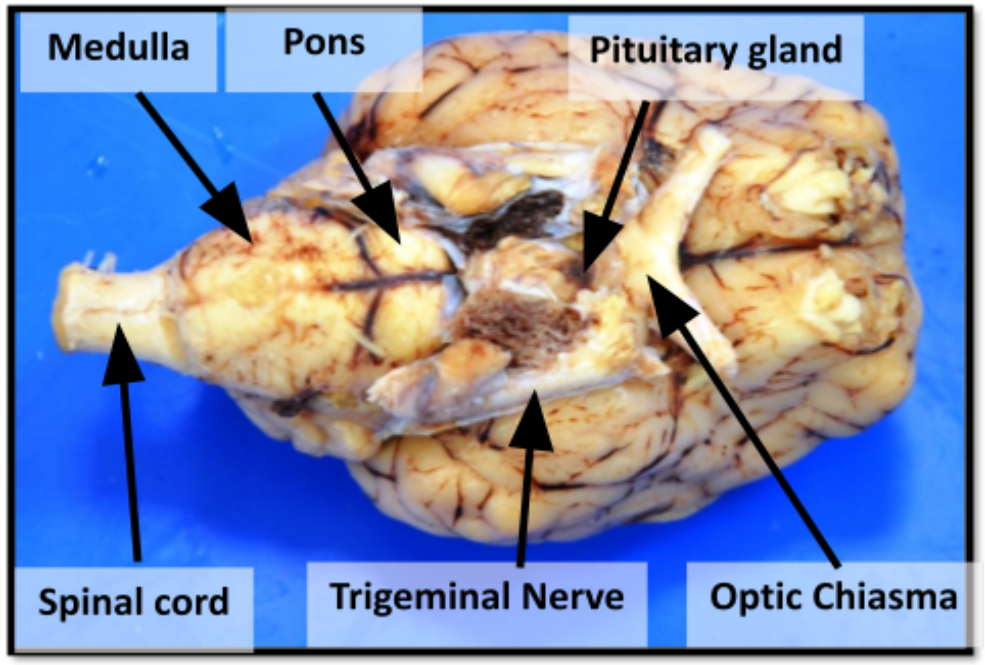
Figure 16: Human brain - Lateral view showing the lobes of the brain



The frontal lobe is bounded by the central sulcus posteriorly and inferiorly by the lateral sulcus. In man, the primary role of the frontal cortex is to mediate executive control through the dopamine system. The parietal lobe is posterior to the frontal lobe and mediates primary sensory processing. The temporal lobe is interior to the parietal lobe, and in man is separated from the parietal lobe and the frontal lobe by the lateral sulcus. The temporal role has been most clearly associated with long-term memory. The occipital lobe is at the posterior of the brain, beneath the occipital bone, and lies immediately above the cerebellum in man. The primary role of the occipital lobe is in visual processing.

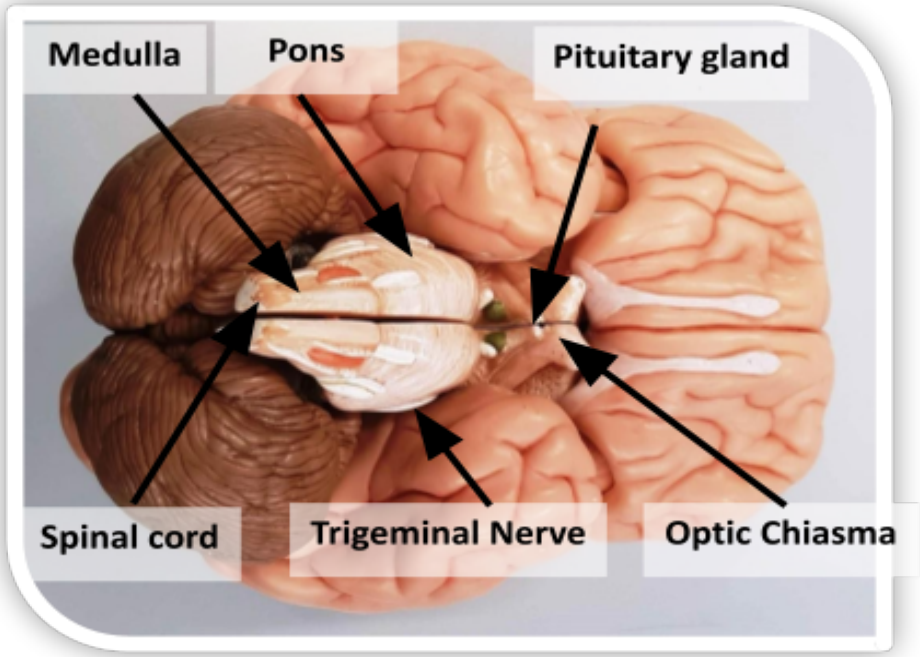
5. **Locate the brain stem.**

Figure 17: Sheep brain - Inferior view showing the brainstem



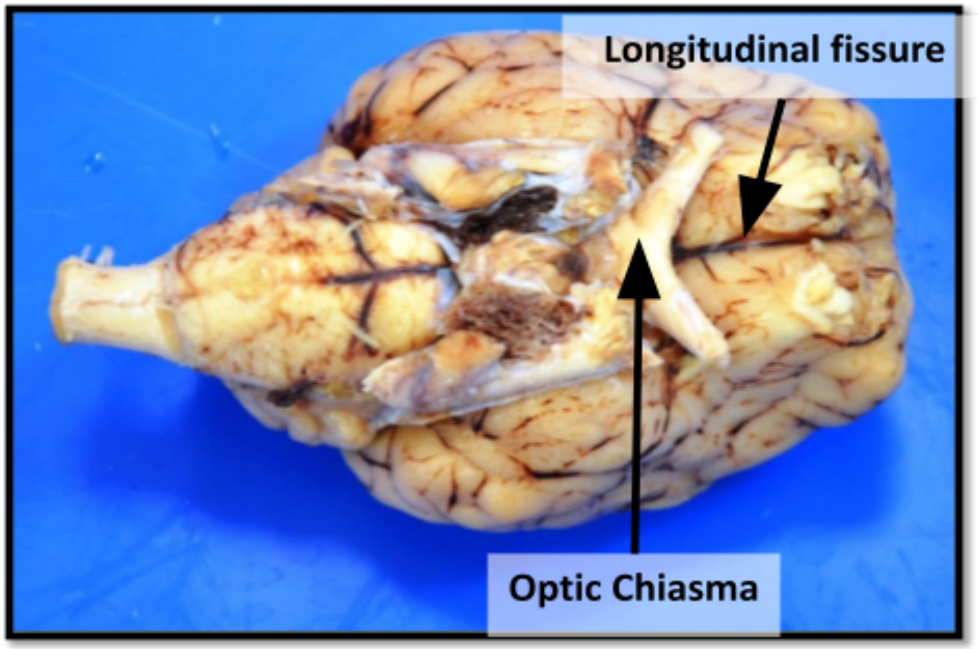
This area is contains the pons, medulla, and cerebellum. Find also the root where the pituitary gland was attached to your brain.

Figure 18: Human brain - Antero-inferior view showing the lobes of the brainstem



6. **Examine the ventral surface of the brain.**

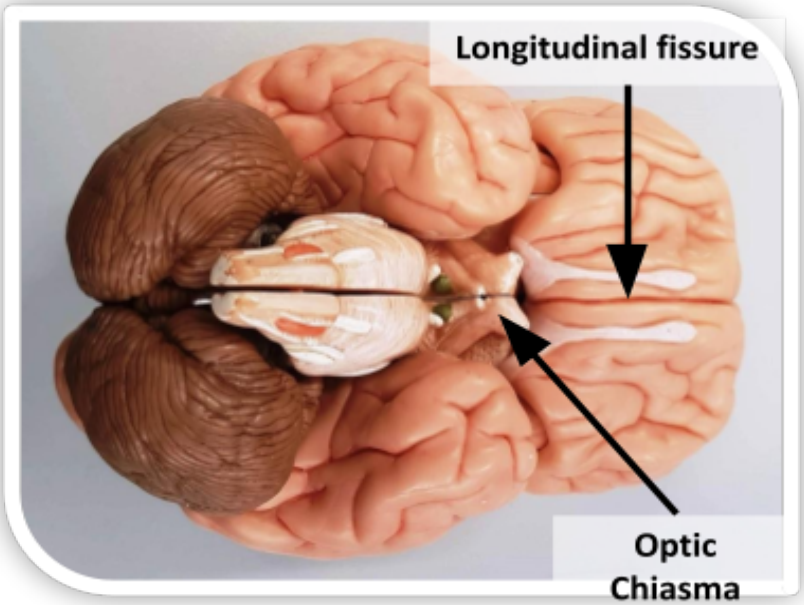
Figure 19: Sheep brain - Inferior view showing the lobes of the optic chiasma



A pair of olfactory bulbs may remain, one under each lobe of the frontal cortex.

Note the optic nerves running posteriorly and medially, meeting in the centre of the brain at the optic chiasm. In the optic chiasm, there is a partial crossover of axons carrying visual information. Any time fibres in a tract or nerve cross the midline of the brain it is called a decussation.

Figure 20: Human brain - Antero-inferior view showing the lobes of the optic chiasma



Stamp Tasks:

1. Complete the Table on Page 12.

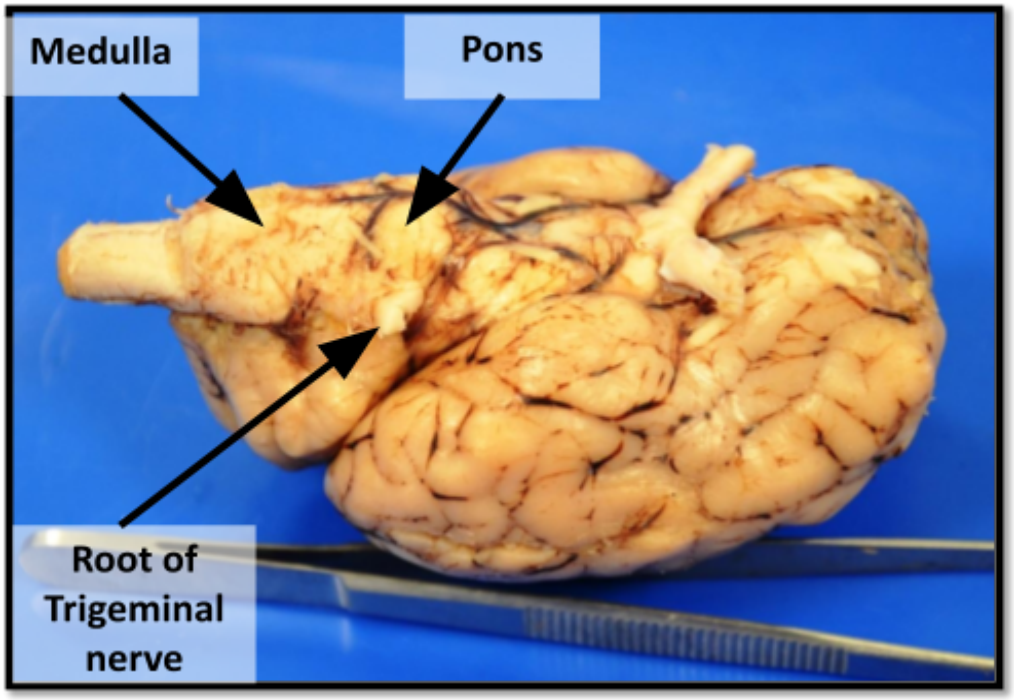
2. Indicate the illustrated regions on your sheep brain and on the human brain model to a facilitator.

3. Indicate the illustrated regions on your sheep brain and on the human brain model to a facilitator.

A2: Acquire Completion Stamp

7. **Find the medulla oblongata which is an elongation below the pons on your sheep brain and on the human brain model.**

Figure 21: Sheep brain - Lateral view showing the brainstem Part A



Nearby, you should also be able to find a particularly large root amongst the cranial nerves entering the ventral brain stem. This is the root of the trigeminal nerve, which innervates the face and provides sensory information.

Figure 22: Sheep brain - Lateral view showing the brainstem Part B

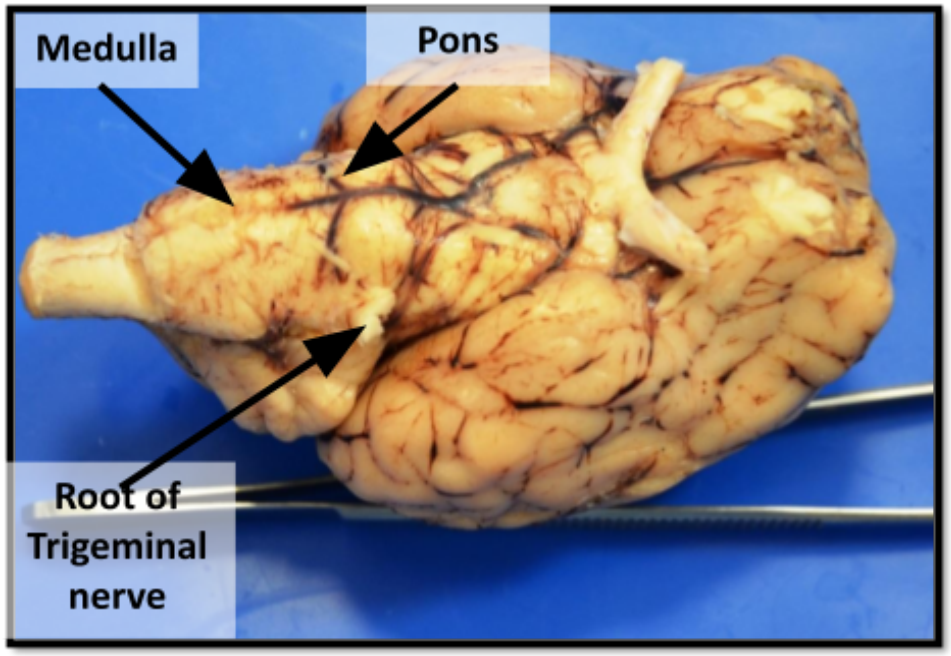
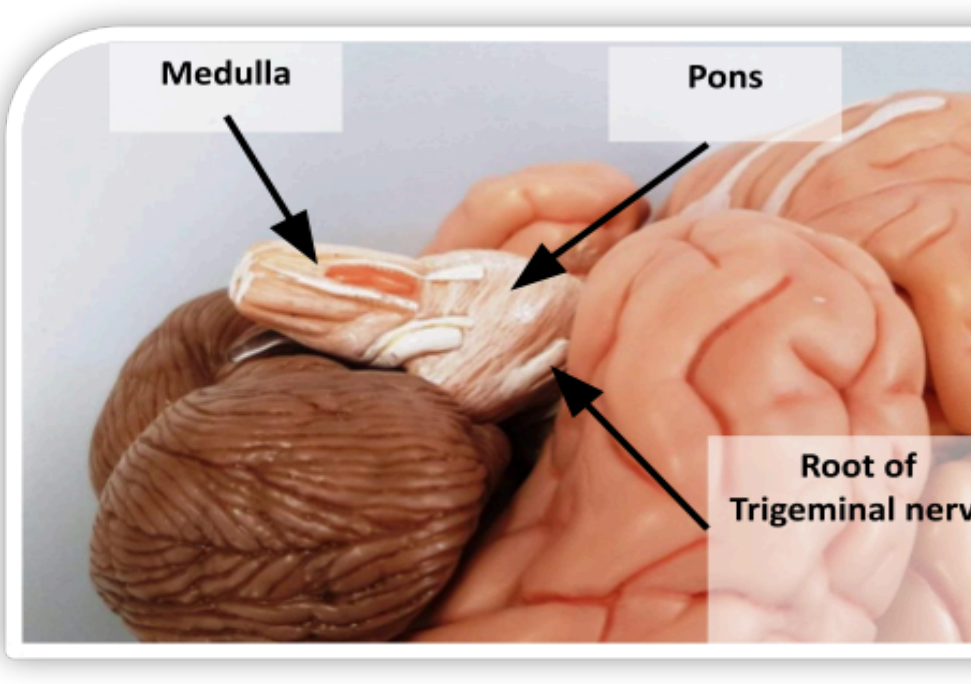
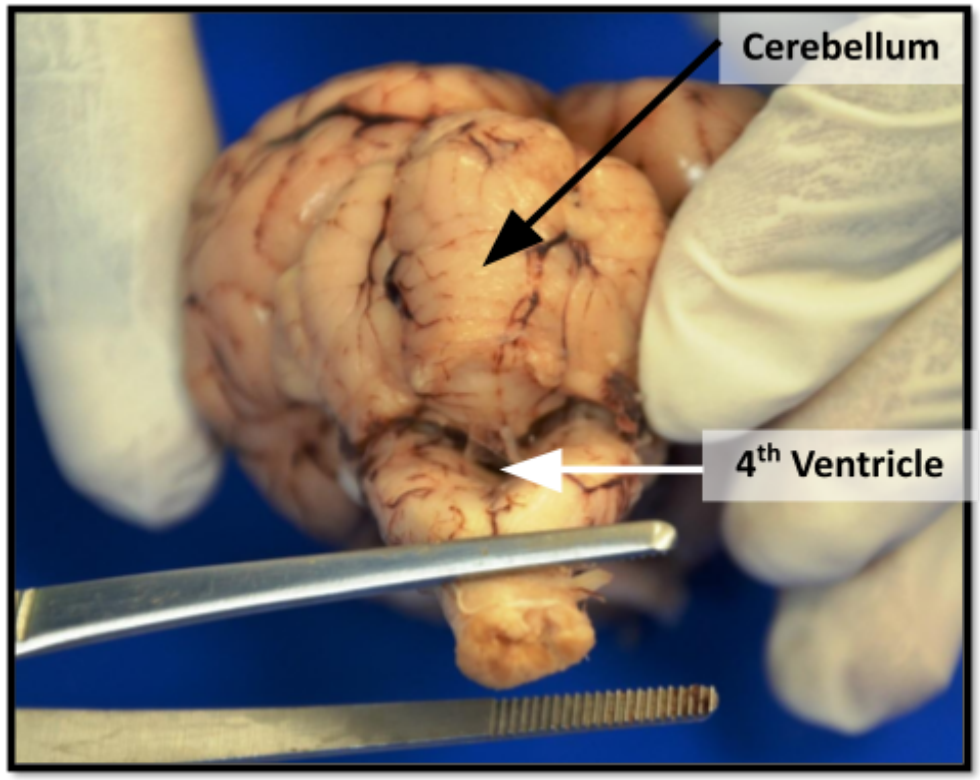


Figure 23: Human brain - Lateral view showing the brainstem


Medulla
Pons
Root of
Trigeminal nerv

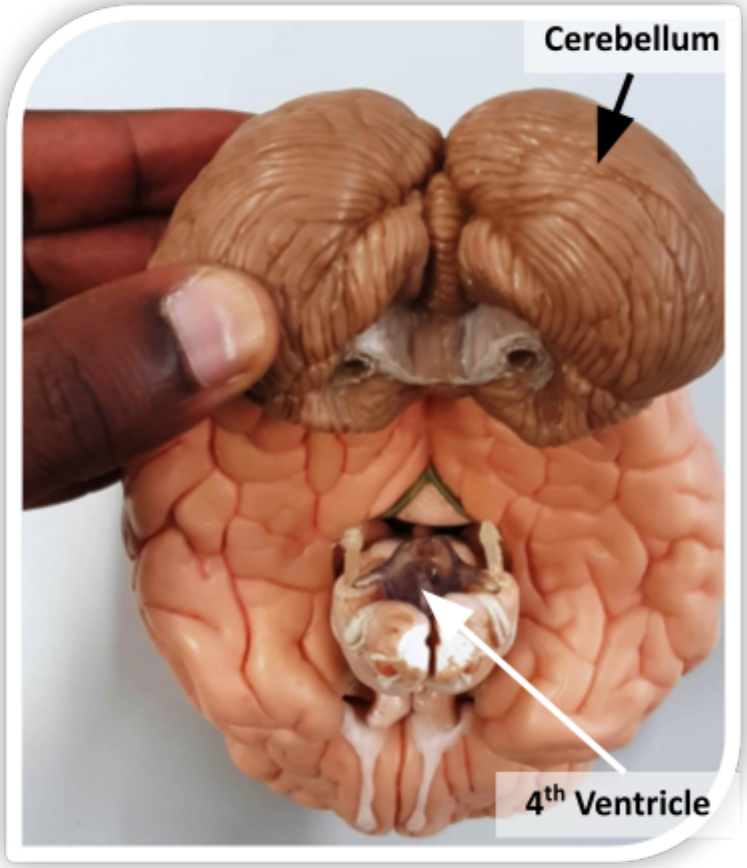
8. **Find the 4th ventricle and the cerebellum on your sheep brain and on the human brain model.**

Figure 24: Sheep brain - Caudal view showing the 4th ventricle



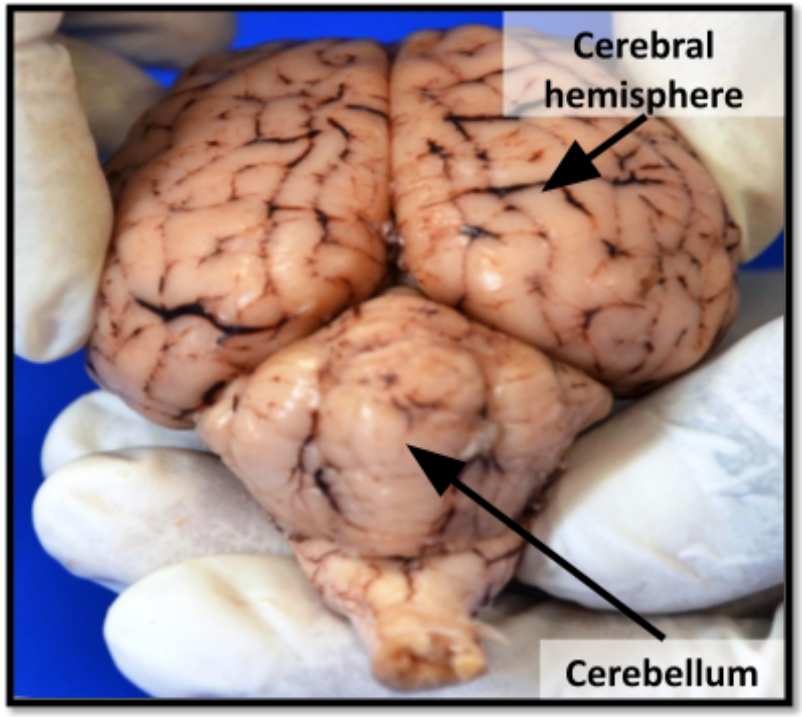
The cerebellum is responsible for the execution and monitoring of motor commands received from the motor cortex. The fourth ventricle contains cerebral fluid and is continuous with the cerebral aqueduct – from here, cerebral fluid can enter the sub-arachnoid space.

Figure 25: Human brain - Inferior view showing the 4th ventricle



9. **Find the superior and inferior colliculi on your sheep brain and on the human brain model**

Figure 26: Sheep brain - Posterior view showing hidden superior and inferior colliculus



The primary role in humans of the colliculi, collectively referred to as the tectum, is the control of eye movements – specifically saccades. Be **CAREFUL NOT TO BREAK** your brainstem into two!

Figure 27: Sheep brain - Posterior view showing exposed superior and inferior colliculus

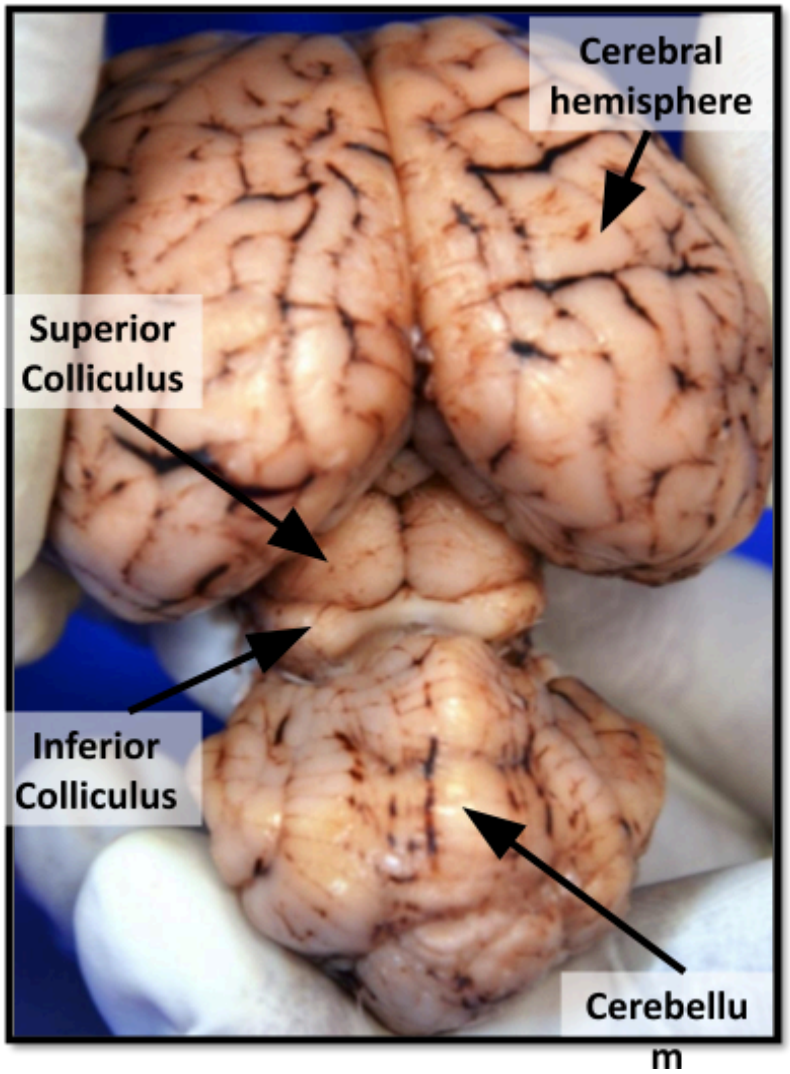
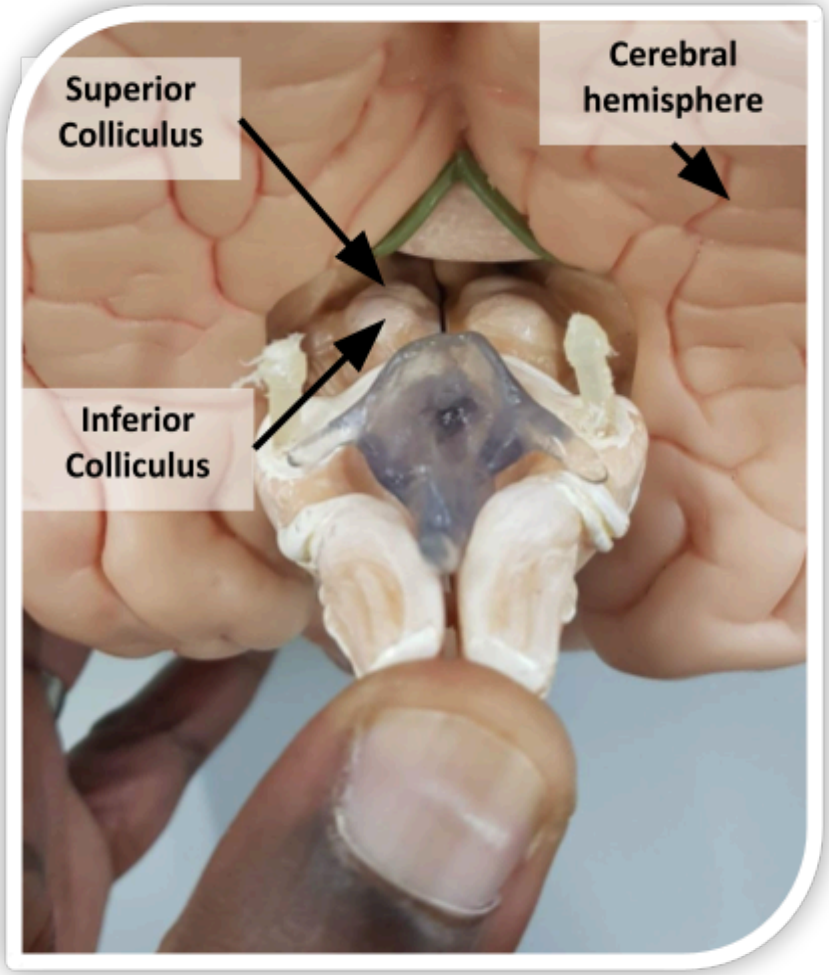
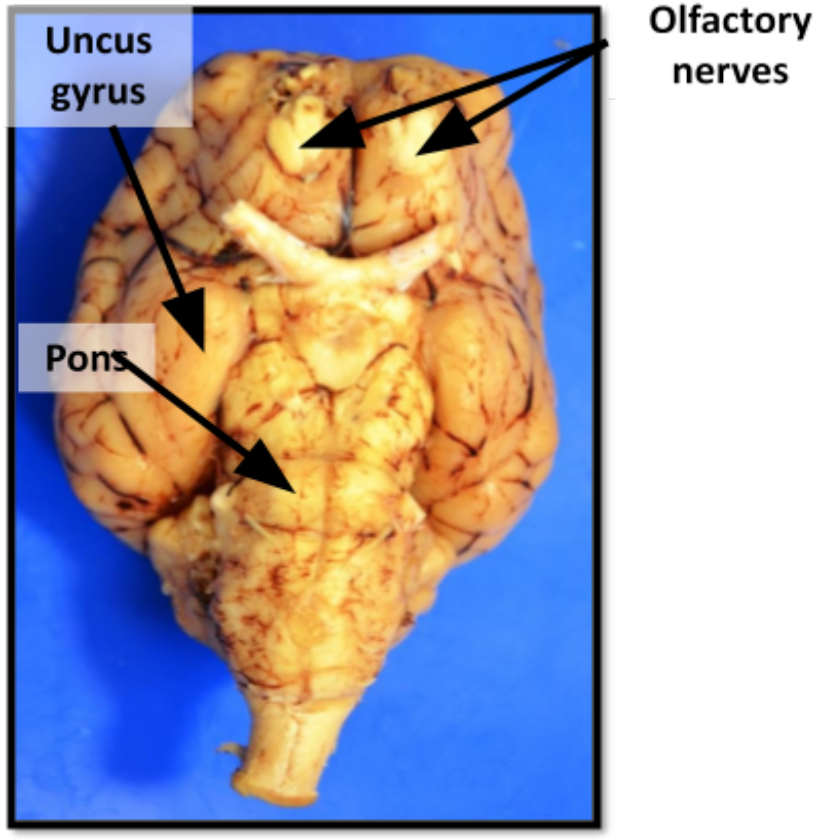


Figure 28: Human brain - Lateral-posterior view showing the colliculus


Superior Colliculus
Cerebral hemisphere
Inferior Colliculus

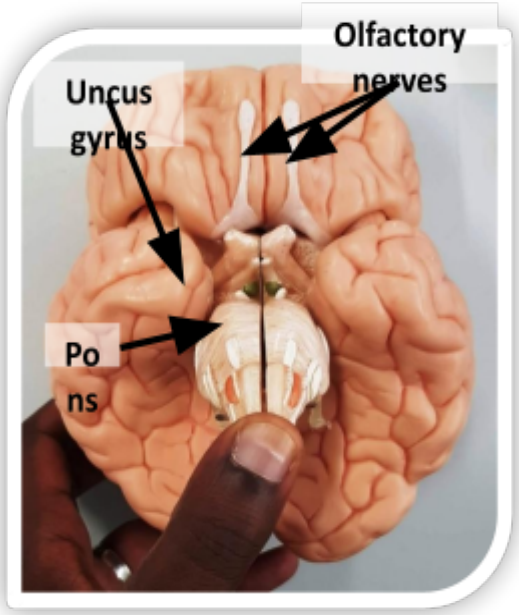
10. **Identify the Uncus, a large gyrus that runs laterally on the ventral surface of your sheep brain and on the human brain model**

Figure 29: Sheep brain - Ventral view showing the mammillary bodies



Deep to the uncus is the hippocampal gyrus so named because the hippocampus lies dorsal to it.

Figure 30: Human brain - Antero-inferior view showing the mammillary bodies



Stamp Tasks:

1. **Show you Tutor the 4th ventricle, cerebellum and superior and inferior colliculi on both the sheep brain specimen and plastic human brain.**

A3: Acquire Completion Stamp

9. Examination of a mid-sagittalsection

DO NOT CUT ANYTHING BEFORE CHECKING WITH A FACILITATOR

11. Make a mid-sagittal cut your sheep brain.

Position the brain on its ventral surface and, holding it securely, cut along the longitudinal fissure using slicing knife with a granton edge (blade guard), as indicated in Figure 31 below:

Figure 31: Cutting the ventral surface of the sheep brain sagittally

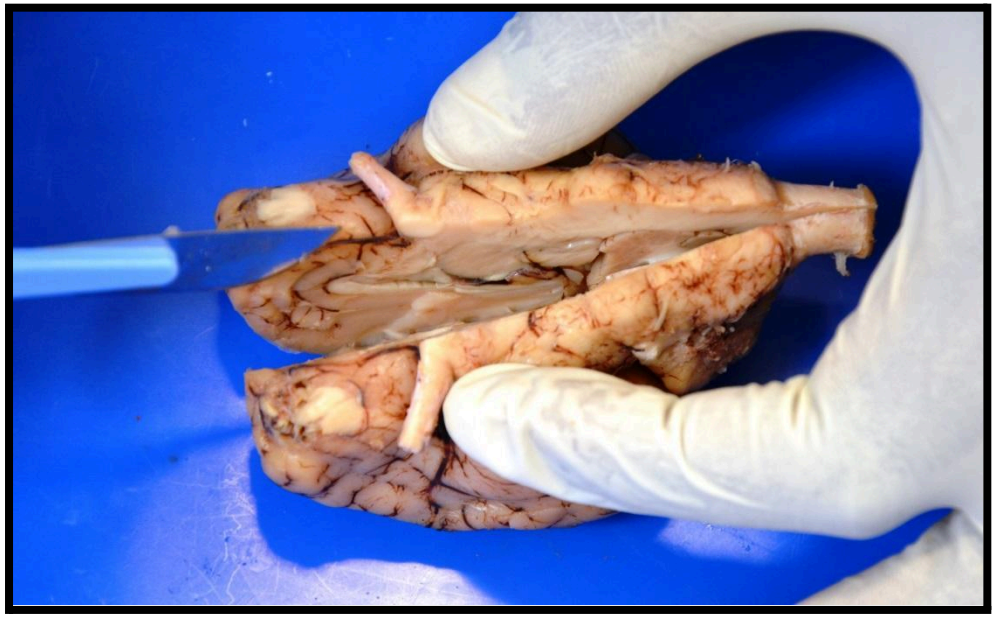


Figure 32: Sheep brain – Two hemisections

First, on this section you can find the lateral and third ventricles and the cerebral aqueduct that connects them. You may also be able to see the septum pellucidum, which lies inside the lateral ventricles.

Figure 33: Sheep brain - Medial view

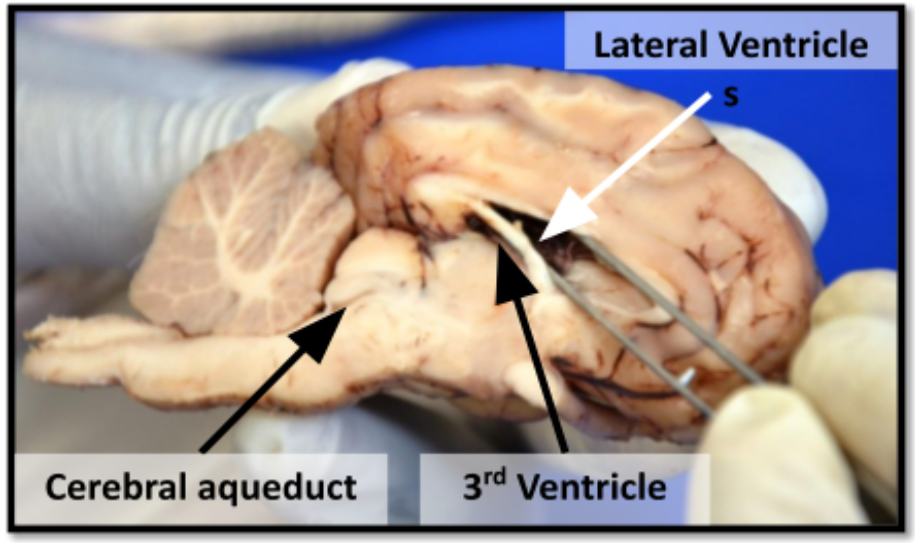
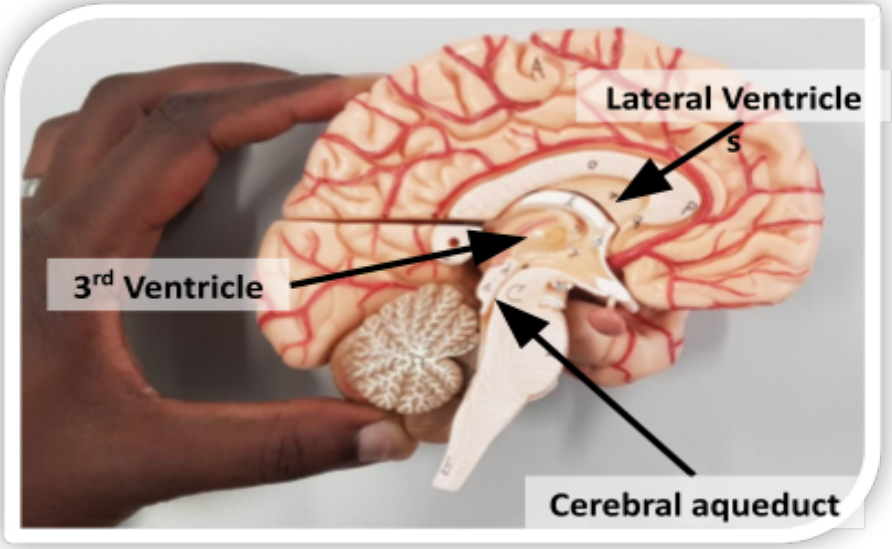


Figure 34: Human brain - Medial view



Looking at this mid-sagittal section further, you will see the corpus callosum. This is the largest of all the commissures, the fibres that connect the two hemispheres of the brain.

Figure 35: Sheep brain - Medial view

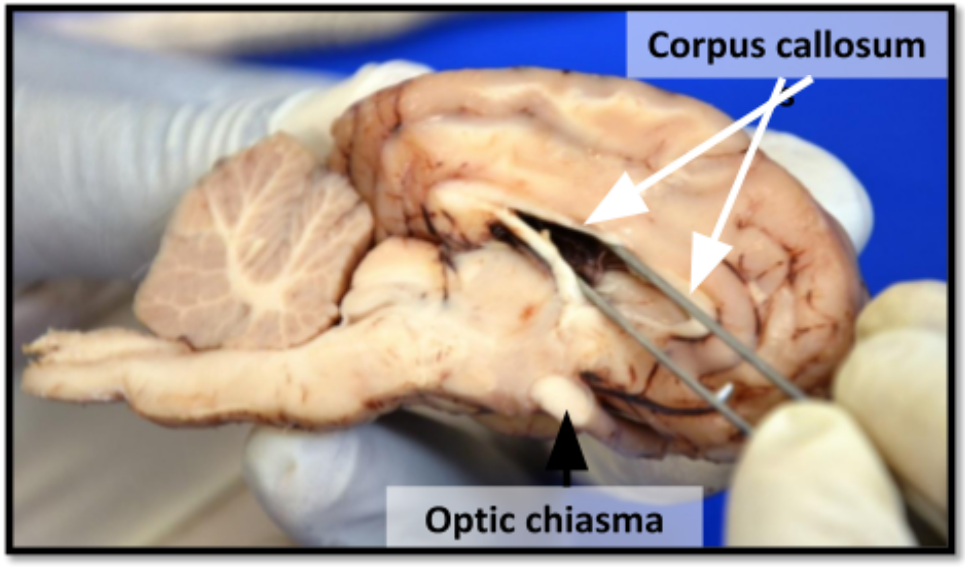


Figure 36: Human brain - Medial view

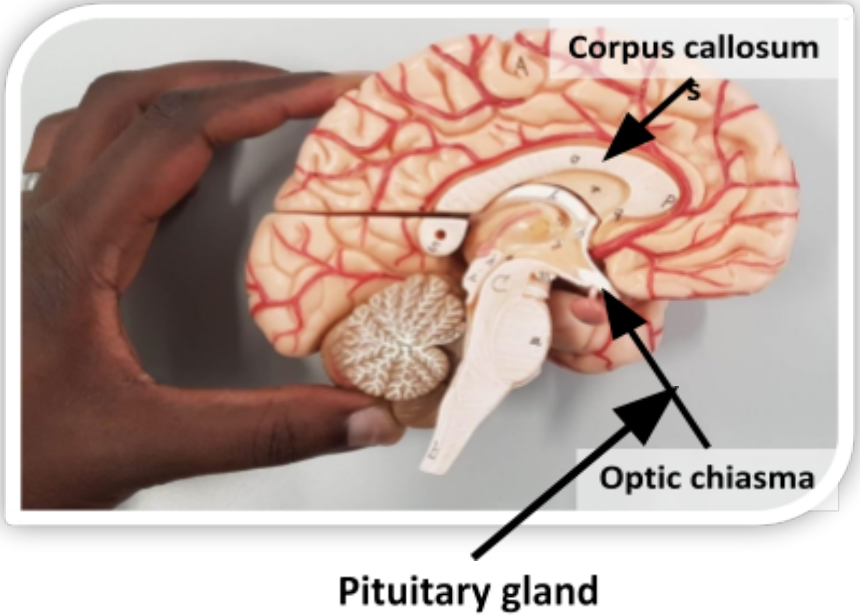
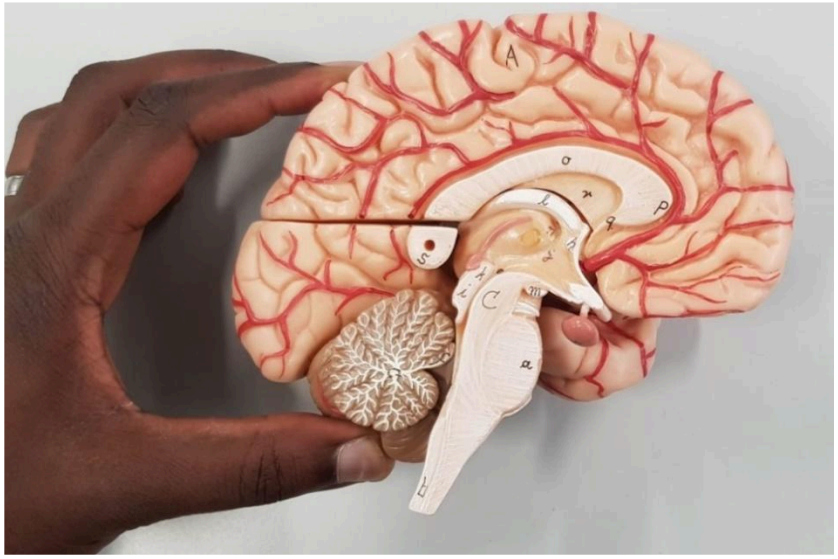


Figure 37: Sheep brain - Medial view

Finally, look at the cerebellum and observes its distinctive pattern of grey and white matter – the so-called 'tree of life'.

Figure 38: Human brain - Medial view



Stamp Tasks:

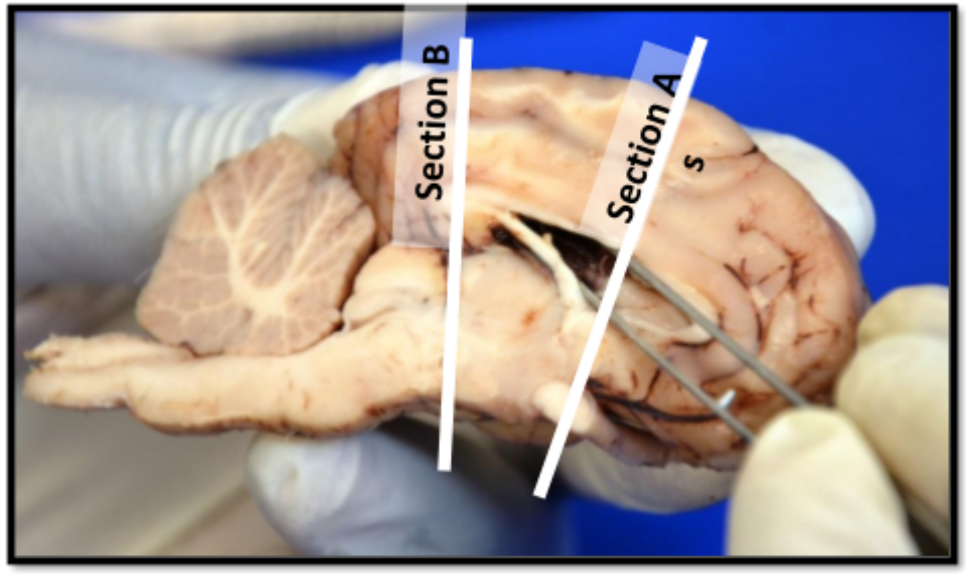
1. **Indicate the following regions on your sheep brain and on the human brain model to a Tutor**
    - **a. Lateral ventricle**
    - **b. Cerebellum**
    - **c. Cerebral aqueduct**
    - **d. Massa intermedia (interthalamic connection)**
    - e. **Corpus callosum**

B: Acquire Completion Stamp

10. Examination of Coronal sections

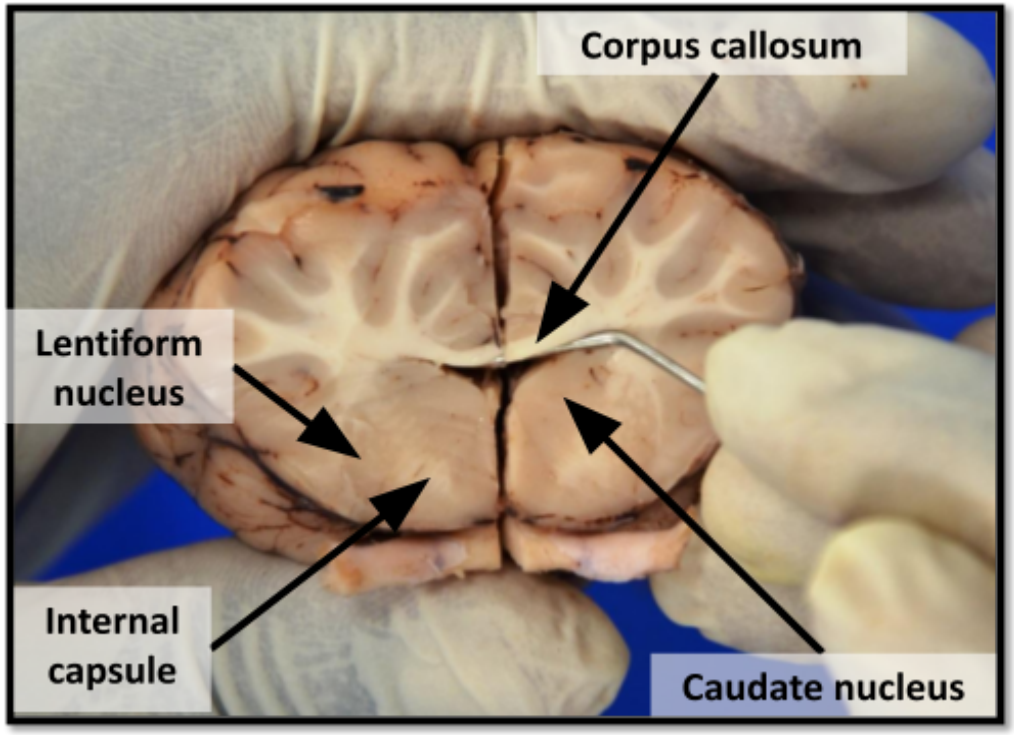
Using the slicing knife with a granton edge (blade guard), section the brain as illustrated below; the accuracy with which you make this and the subsequent section, and a degree of luck, will determine how many of these structures you are able to identify. These structures are rather small in sheep – the task would be easier done in the human brain.

Figure 39: Sheep brain - Medial view Sheep brain showing where coronal sections are to be made



In section A, you should be able to see the prominent lateral ventricles. Ventral to these are the basal ganglia, a group of nuclei which include the caudate nucleus separated from the lentiform nucleus by a strand of white matter called the internal capsule.

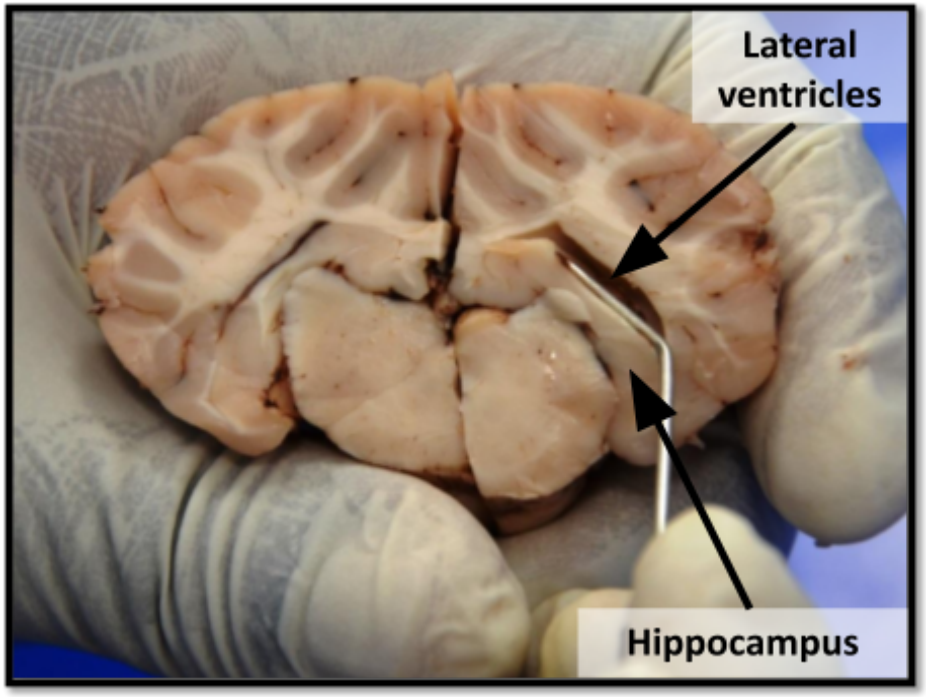
Figure 40: Sheep brain - Coronal section



Using the slicing knife with a granton edge (blade guard), and your accumulating experience of brain-dissection, cut section B your sheep brain.

This should reveal a great view of the hippocampus and, beside it, the lateral ventricles you have seen already. These should be clearly apparent, but remember that in life they are full of cerebrospinal fluid. The hippocampus is involved in the formation of memory, the mechanism for which will briefly discuss in a later session.

Figure 41: Sheep brain - Coronal section



Stamp Tasks:

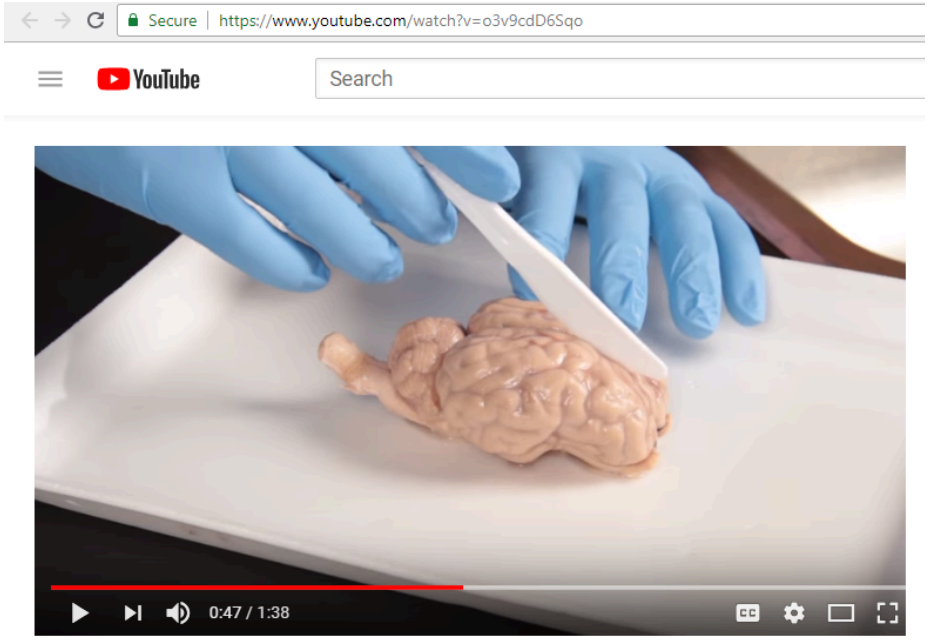
1. **Indicate the illustrated regions to a facilitator**

C: Acquire Completion Stamp

11. Further resources

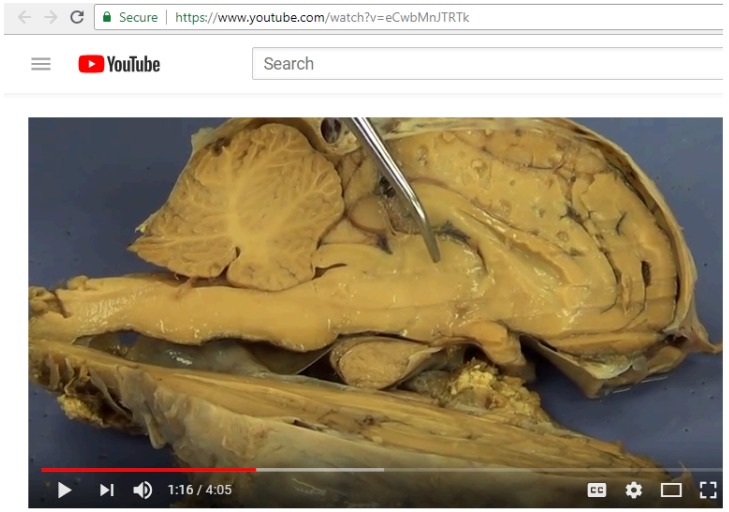
The following three videos present useful demonstrations of labelled sheep brain dissections. If you press **Ctrl + Click**, you will be taken to the video

Video 1: Video A - Demonstration of Sheep Brain dissection



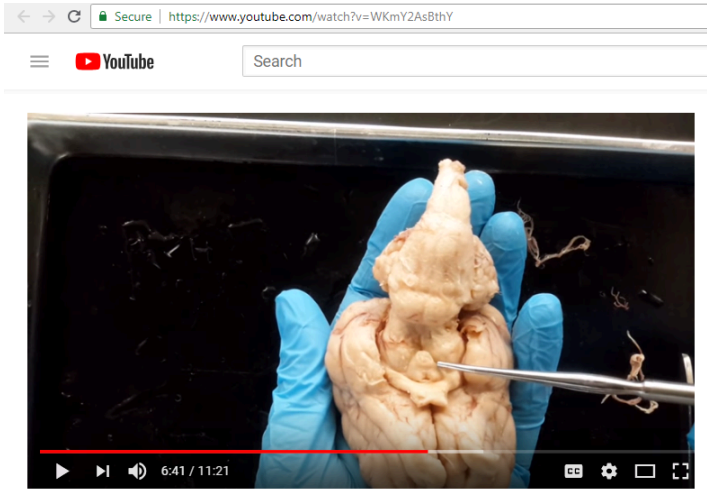
Carolina Quick Tip®: Sheep Brain Dissection

Video 2: Video B - Demonstration of Sheep Brain dissection



Sheep Brain Dissection

Video 3: Video C - Demonstration of Sheep Brain dissection



Sheep Brain Dissection - part 1