

Internal Structures of the Forebrain

Objectives:

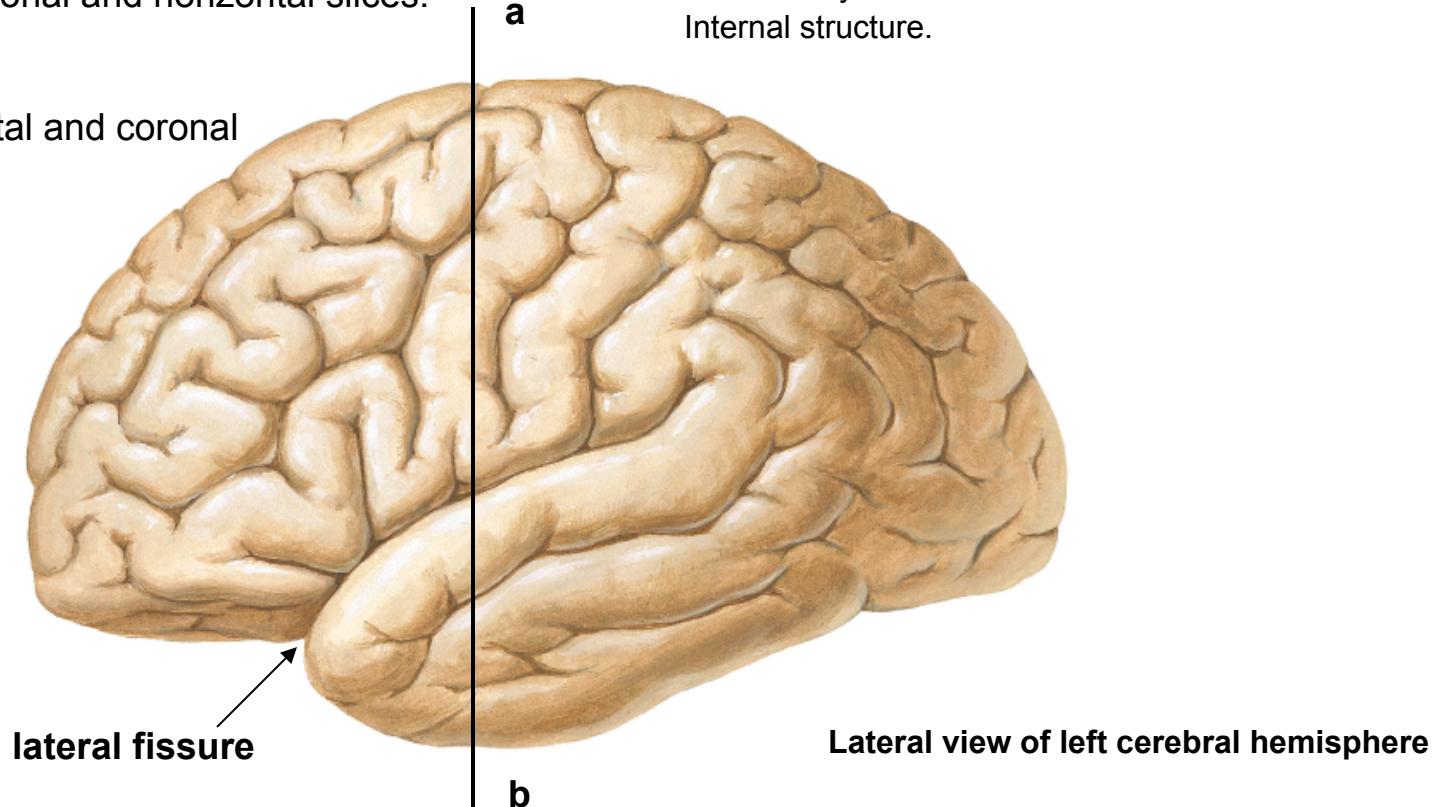
To learn to identify internal structures of the forebrain on coronal and horizontal slices.

Specimens:

Plastinated horizontal and coronal brain slices

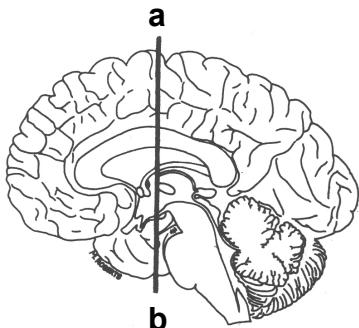
Looking inside the Forebrain...

Slicing the forebrain in the coronal plane indicated by the line a - b reveals its Internal structure.



Lateral view of left cerebral hemisphere

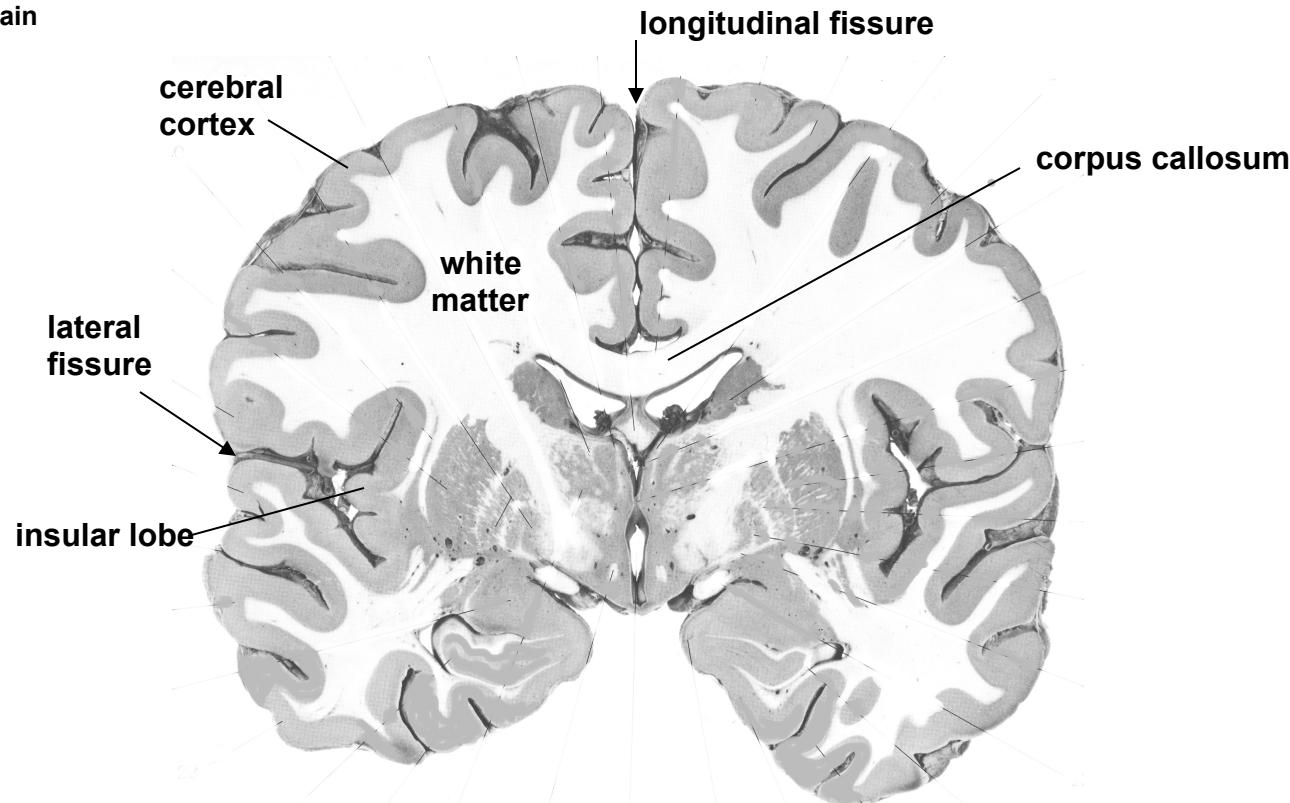




medial surface of
the right half of the brain

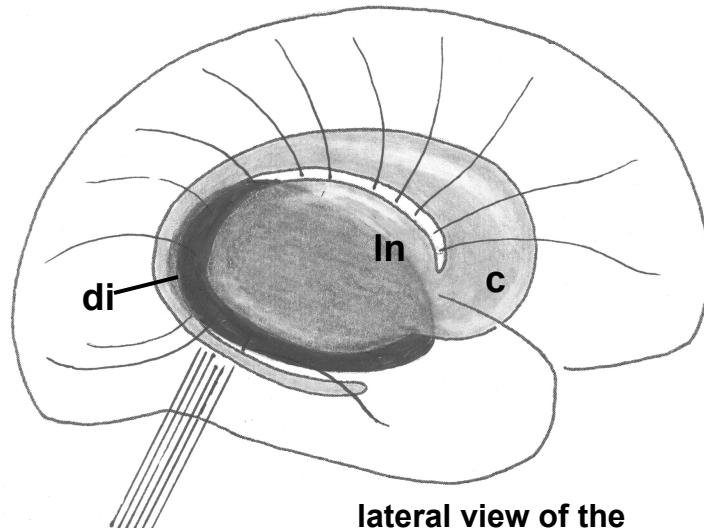
Structures of the Forebrain on a Coronal Slice

- The surface of the hemispheres is covered by the **cerebral cortex**.
- The **white matter** beneath the cortex is made up of axons connecting the cortex with other parts of the nervous system. Some of these axons connect the cortical areas of the two hemispheres through the **corpus callosum**.
- The **insular lobe** (insula) of the cortex forms the floor of the deep **lateral fissure**.
- The hemispheres are separated dorsally by the **longitudinal fissure**.



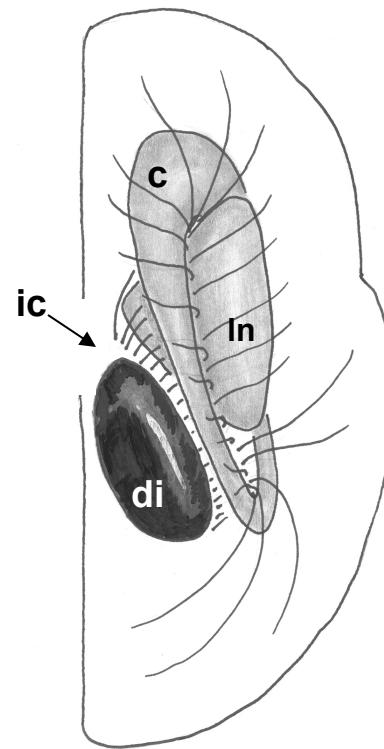
(M Roberts, J Hanaway & K Morest, *Atlas of the Human Brain in Section*, 2/E, Lea & Febiger, 1987)

Internal Structures of the Forebrain



lateral view of the right cerebral hemisphere

The **telencephalon** and **diencephalon** make up the **forebrain**. During fetal development the telencephalic vesicle on each side enlarges, covers, and fuses with the diencephalon to form the cerebral hemisphere.

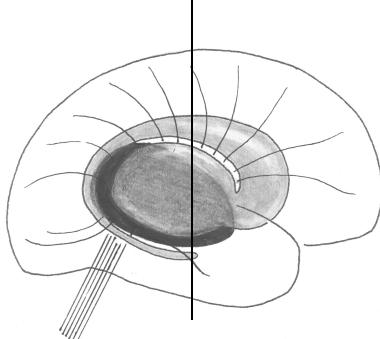


dorsal view of the right cerebral hemisphere

The telencephalon consists of the cerebral cortex and the deep telencephalic nuclei of the **basal ganglia**: the **caudate (c)** and the **lentiform nucleus (In)**.

The **diencephalon (di)** is located medial to the basal ganglia inside the cerebral hemisphere (see dorsal view).

A massive bundle of axons separates the diencephalon and caudate (medially) from the lentiform nucleus (laterally). This fiber system is the **internal capsule (ic)**. Fibers of the internal capsule are going to and from the overlying cerebral cortex.

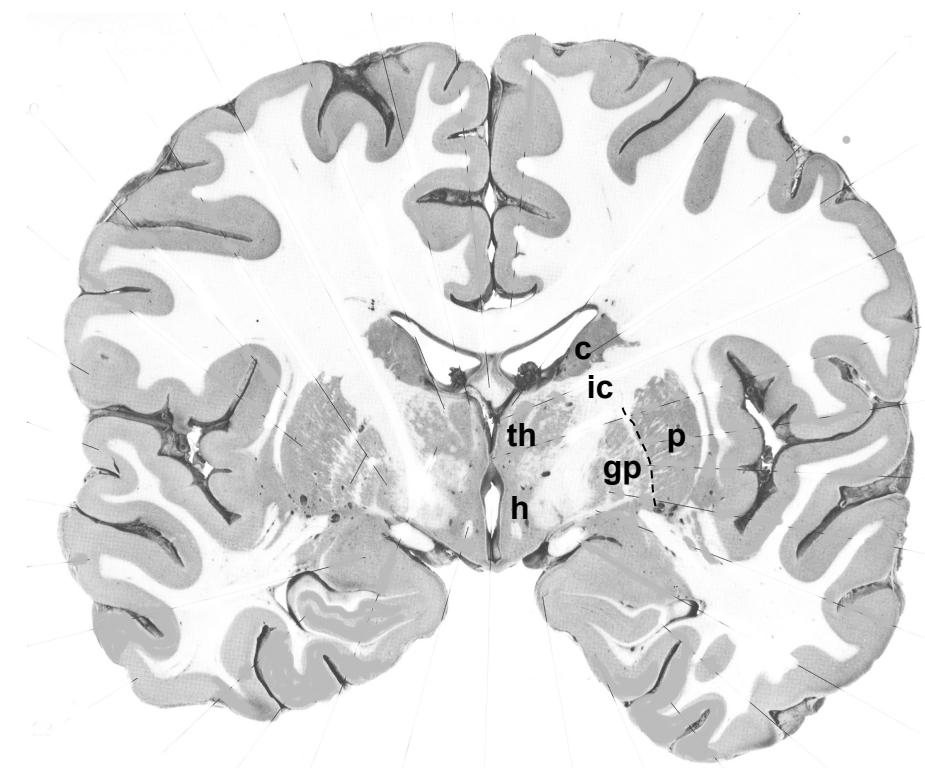
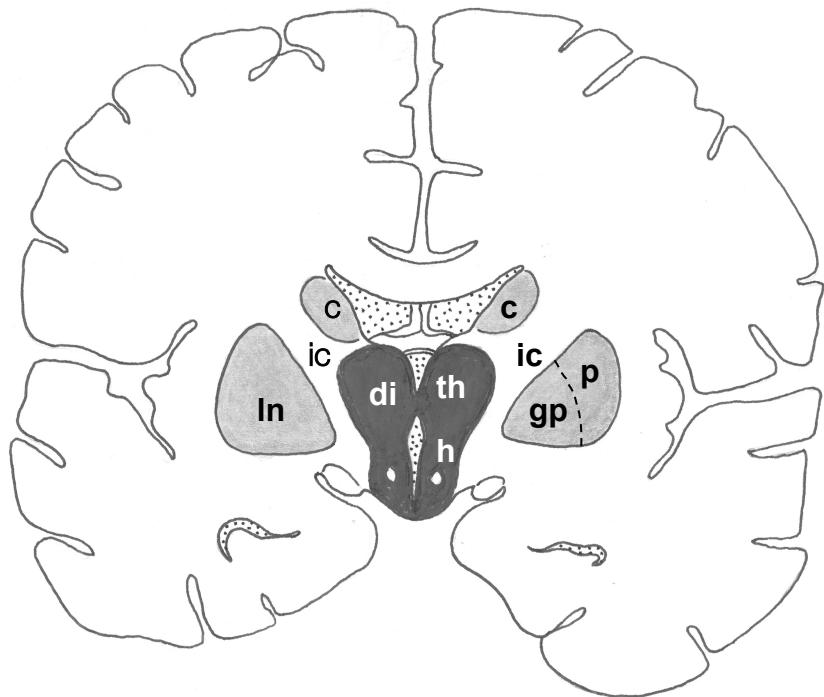


Deep Gray Matter on a Coronal Slice through the Forebrain

In a coronal section we see the **diencephalon (di)** and **caudate (c)** on the medial side of the **internal capsule (ic)**. The diencephalon includes the **thalamus (th)** and **hypothalamus (h)**

The lentiform nucleus is on the lateral side of the internal capsule.

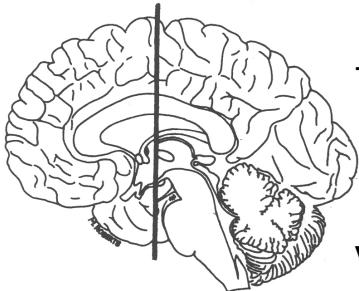
The lentiform nucleus is composed of the **putamen (p)** and the **globus pallidus (gp)**.



(M Roberts, J Hanaway & K Morest, *Atlas of the Human Brain in Section*,

2/E, Lea & Febiger, 1987)

The Ventricles on a Coronal Slice through the Forebrain

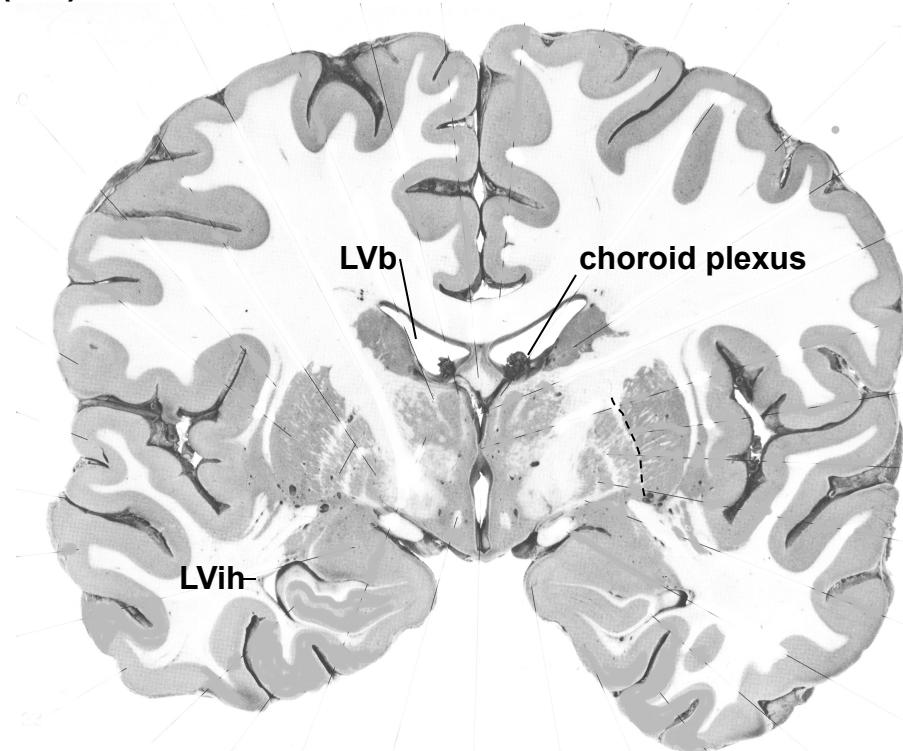
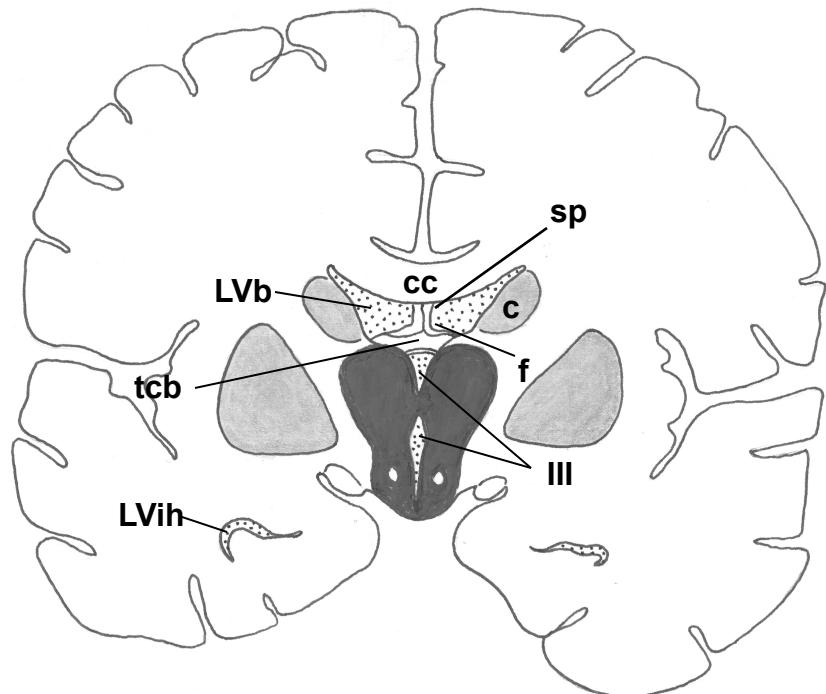


This slice reveals the **body (b)** and the **inferior horns (ih)** of the **lateral ventricles (LV)**.

The body of each LV is roofed by the **corpus callosum (cc)**. Its walls are the **caudate (c)** and the **septum pellucidum (sp)**. Its floor is the **fornix (f)** and tela choroidea with choroid plexus (not shown on the diagram).

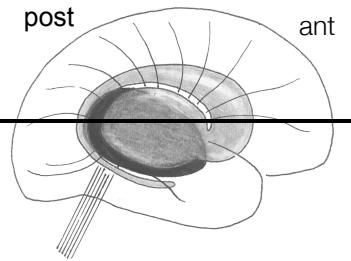
Ventricle III surrounds the massa intermedia of the thalamus. Its roof of tela choroidea also has a choroid plexus.

The space above the roof of the third ventricle (III) is the **transverse cerebral fissure (tcb)**.



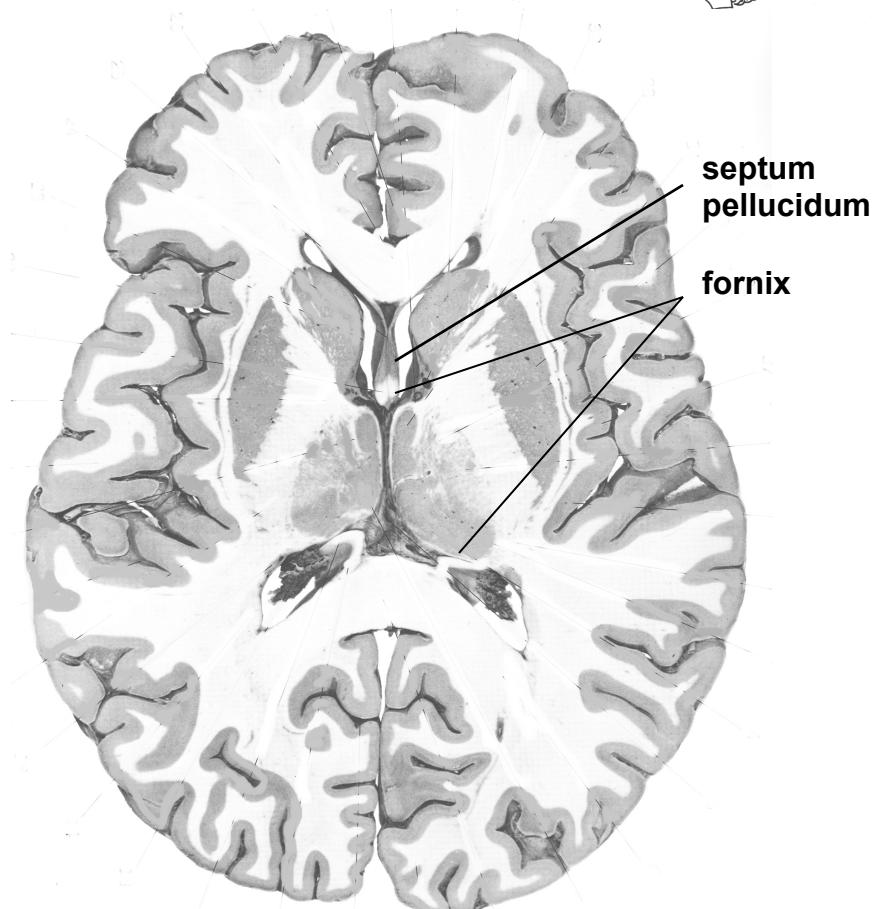
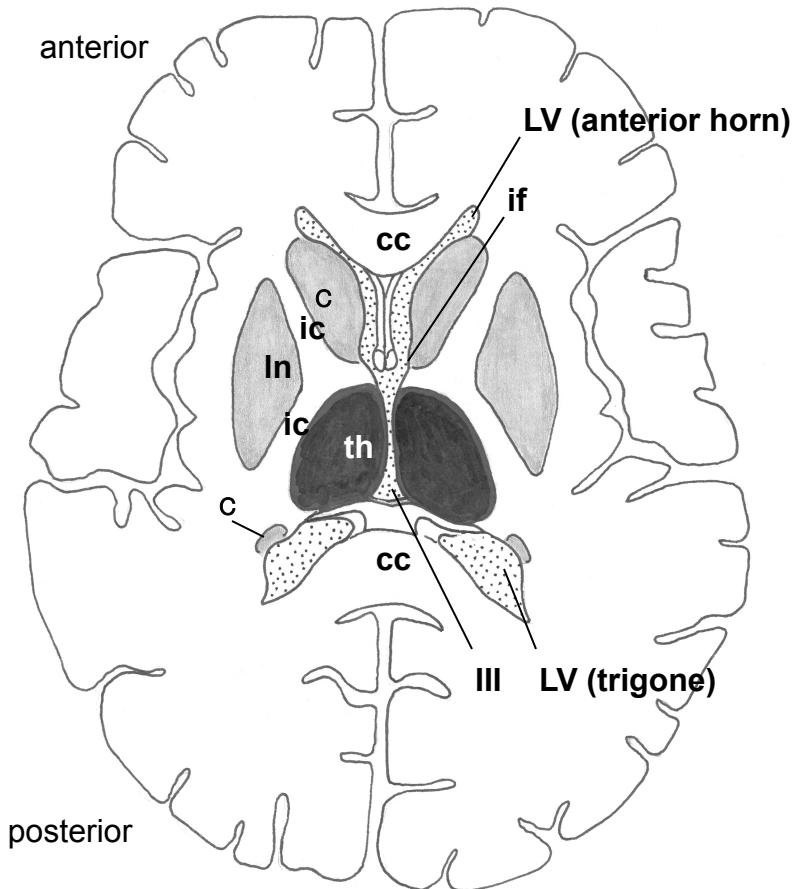
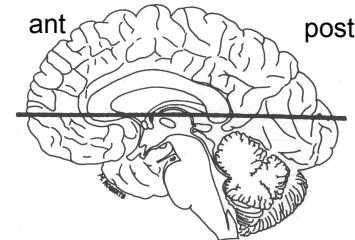
(M Roberts, J Hanaway & K Morest, *Atlas of the Human Brain in Section*,

2/E, Lea & Febiger, 1987)



A Horizontal Slice through the Forebrain

This slice cuts through the corpus callosum, the caudate, and the lateral ventricles both anteriorly and posteriorly. The **interventricular foramen (if)** on each side opens from the lateral ventricle into ventricle III.



(M Roberts, J Hanaway & K Morest, *Atlas of the Human Brain in Section*,

2/E, Lea & Febiger, 1987)

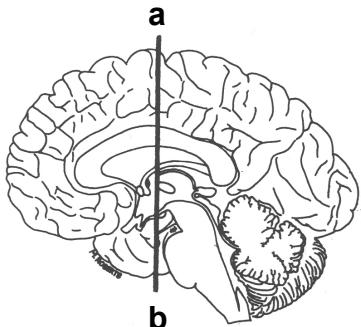
Internal Structures of the Forebrain

Question I

Match each of the structures (A - L) with its description in one of the statements (1 - 13).

- | | | | |
|----|---|-----|--|
| A. | Septum pellucidum | 1. | A compact fiber bundle through which the cortex communicates with other parts of the nervous system. |
| B. | Lateral ventricle | 2. | Fibers that interconnect the right and left hemispheres. |
| C. | Corpus callosum | 3. | Separates the two cerebral hemispheres |
| D. | Internal capsule | 4. | Diencephalic area for processing ascending sensory signals. |
| E. | Cerebral cortex | 5. | Diencephalic area that integrates activities of the autonomic nervous system. |
| F. | Lateral fissure | 6. | Separates the frontal lobe from the temporal lobe. |
| G. | Ventricle III | 7. | Cortex lying in the floor of the lateral fissure |
| H. | Insular lobe | 8. | Surface gray matter of the telencephalon |
| I. | Basal ganglia (Caudate and Lentiform nucleus) | 9. | Deep gray matter of the telencephalon |
| J. | Thalamus | 10. | Cerebrospinal fluid exits this ventricle via the interventricular foramen. |
| K. | Hypothalamus | 11. | Communicates with the cerebral aqueduct |
| L. | Longitudinal fissure | 12. | This membrane forms the medial wall of the lateral ventricle. |

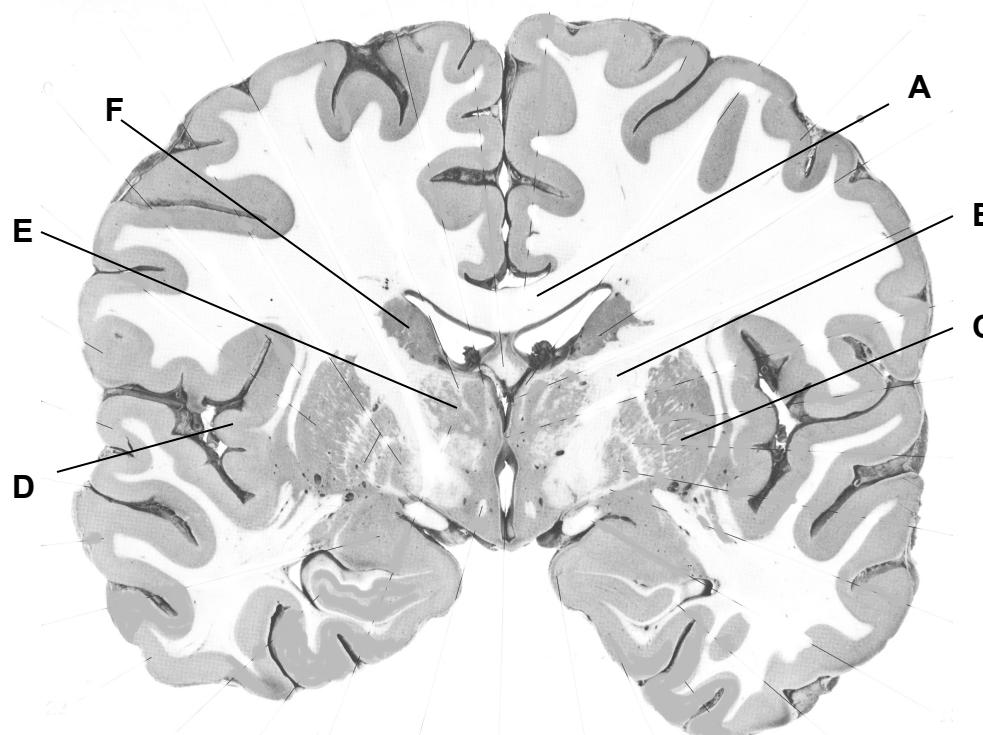
Question II



medial surface of
the right half of the brain

Match each of the terms below (1 - 6) with the appropriate structure (A - F) on the coronal slice of the brain.

1. Thalamus
2. Insular lobe
3. Corpus callosum
4. Internal capsule
5. Putamen of the basal ganglia
6. Caudate



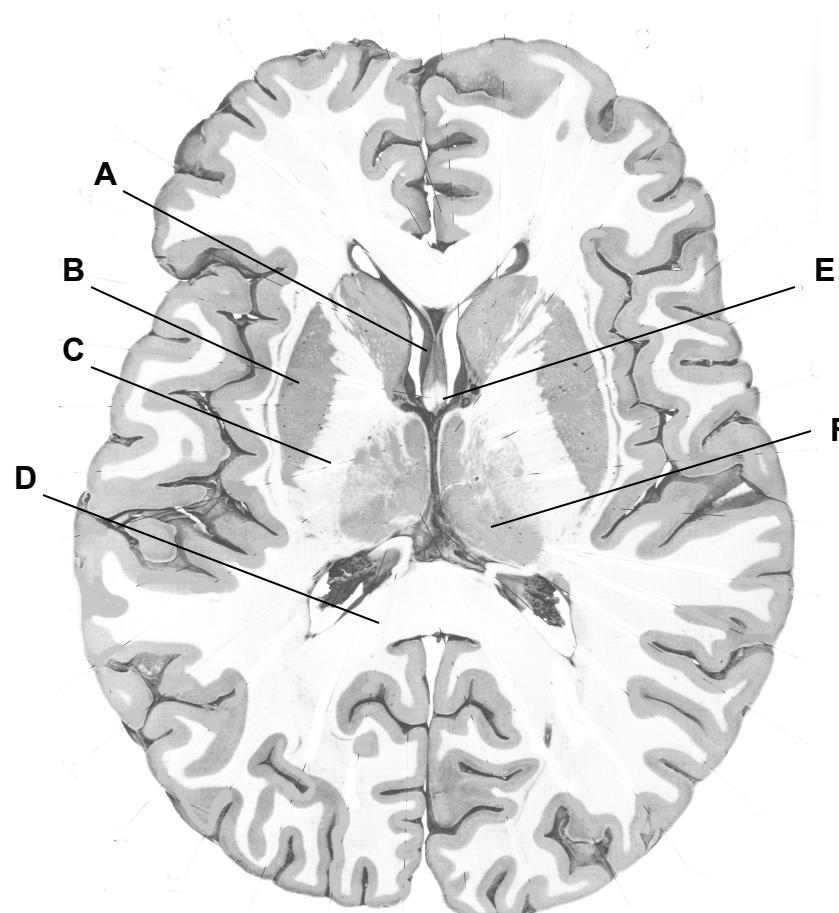
(M Roberts, J Hanaway & K Morest, *Atlas of the Human Brain in Section*,

2/E, Lea & Febiger, 1987)

Question III

Match each of the terms below (1 - 6) with the appropriate structure (A - F) on the horizontal slice of the brain.

1. Thalamus
2. Septum pellucidum
3. Corpus callosum
4. Internal capsule
5. Lentiform nucleus
6. Fornix



(M Roberts, J Hanaway & K Morest, *Atlas of the Human Brain in Section*,

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Internal Structures of the Forebrain
ANSWER SHEET

Question I

1. D
2. C
3. M
4. J
5. K
6. F
7. H
8. E
9. I
10. B
11. G
12. A

Question II

1. E
2. D
3. A
4. B
5. C
6. F

Question III

1. F
2. A
3. D
4. C
5. B
6. E