

Introduction to the Central Nervous System: Surface Topography

Objective

1. To become familiar with the general anatomical organization of the CNS and to learn the general functions of major cortical and subcortical regions.
NTA Ch 1, pgs. 5-19
2. To review the meninges
NTA Ch 1, pgs. 19-23
3. To become familiar with neuroanatomical terminology
NTA Ch 1, pgs. 21-23
Key Figs: 1-4; 1-6; 1-7; 1-8; 1-9; 1-10

Virtually all topics covered in this lab will be revisited in later labs, when we consider the functional organization of the different neural systems. Keep in mind that our goal for this (and the next) lab is to develop a general understanding of brain organization. Details will follow...

Study plan for this and all subsequent labs:

Review materials prior to attending lab

During lab, be prepared to identify structures listed in the key terms.

Lab resources

Whole and hemisected brains will be available, along with lab instructors for each group; InteractiveNeuroanatomy on your curriculum web site

Self evaluation

- Be able to identify all structures listed in key terms and describe briefly their principal functions
- Use neuroanatomy on the web to test your understanding

In this lab and the next, there is a list of media that are available on the curriculum web site. During the laboratory sessions (in the Learning Center) you will not view the interactive media, only preserved specimens, models, and projected static images. (Your instructor will make the sections come alive!) When you are reviewing the material after lab, as well as before the exams, you should use this listing in conjunction with material on the web.

List of media

SA-2 Lateral brain surface

The most constant sulci and fissures must be identified in order to locate the four major lobes into which each hemisphere is divided (frontal, parietal, temporal, and occipital). Locate the lateral sulcus and the central sulcus on the dorsolateral surface of the hemisphere. What lobe is anterior to the central sulcus? Identify the superior inferior and middle frontal gyri. Locate approximate position of Broca's area on the left hemisphere. What is the function of this area? Identify the precentral and postcentral gyri. What are their respective functions?

Trace the lateral fissure into the parietal lobe and identify the supramarginal gyrus. Then trace the superior temporal fissure into the parietal lobe and identify the angular gyrus. What is the function of these gyri?

Identify the temporal lobe and the constituent superior, middle, and inferior temporal gyri. Heschl's gyri are located within the lateral sulcus. What sensory information is represented here? Locate the approximate boundaries of the occipital lobe.

SA-1 Medial brain surface

Identify the occipital lobes, in which the parieto-occipital fissure and the calcarine fissure are visible. What sensory modality is represented along the banks of the calcarine fissure? Identify the corpus callosum. Note its C-shaped configuration. We will consider its subdivisions in Laboratory II. Note that the four major lobes of the brain continue onto the medial surface. Paralleling the corpus callosum dorsally is the cingulate gyrus, which is part of the limbic system. Identify the callosal sulcus and cingulate sulcus. What functions do structures in the limbic system subserves?

SA-3 Inferior brain surface

On the inferior surface of the brain, the frontal, temporal, and occipital poles should be identified, as well as the prominent medial bulge of the temporal lobe known as the uncus. Note the relationship of the medial surface of the temporal lobe to the brain stem. The inferior surface of the frontal lobe is referred to as the orbital cortex. Identify the olfactory bulb and tract lying on the orbital gyri. Medial to the olfactory tract identify the gyrus rectus.

Trace the inferior temporal gyrus from the lateral surface onto the inferior surface. Medial to the inferior temporal gyrus is the occipitotemporal gyrus of the temporal lobe. Identify the collateral sulcus. What two types of cortex does the collateral sulcus separate? Identify the parahippocampal gyrus.

Most of the structures of the diencephalon will be seen in a later laboratory, when we examine brain sections. At this point, identify the following structures on the external surface of the diencephalon: mammillary bodies and infundibulum of

the hypothalamus, optic chiasm (just rostral to the infundibulum), and the optic (IIInd) cranial nerve.

SA-5 Brain stem, lateral view

First identify the boundaries of the major brain divisions shown on this drawing. Note that the telencephalon normally eclipses the diencephalon, and in this view components of the basal ganglia – part of the telencephalon – cover the thalamus.

Next, review the cranial nerves, most of which are visible on this drawing. Also identify and review the main functions of the olives, colliculi, and striatum.

brainlobesX Surface anatomy, dorsal-ventral (movie)

Animation rotates around rostro-caudal axis of cerebral hemispheres

Key:

frontal lobe=aqua

parietal lobe=green

temporal lobe=purple

occipital lobe=yellow

brain stem, cerebellum, diencephalon=brown

olfactory and optic nerves=white

brainlobesY Surface anatomy, rostro-caudal rotation (movie)

Animation rotates around dorsoventral axis of cerebral hemispheres

Key:

frontal lobe=aqua

parietal lobe=green

temporal lobe=purple

occipital lobe=yellow

brain stem, cerebellum, diencephalon=brown

olfactory and optic nerves=white

brainstem Brain stem animation Key:

ventricles=aqua

hypothalamus=yellow

thalamus=purple

internal capsule fibers, cerebral peduncle=white

anterior commissure=gray

brain stem, cerebellum=brown

cerebellar cortex=red

brainstemdiencblm Brain stem, cerebellum, and diencephalon (movie)

Key:

ventricles=aqua
hypothalamus=yellow
thalamus=purple
internal capsule fibers, cerebral peduncle=white
anterior commissure=gray
brain stem=green
cerebellum=brown

Key Structures and Terms

BRAIN STEM:

Pyramids
Motor (pyramidal) Decussation
Cranial Nerves
Dorsal Columns
Inferior Colliculus
Superior Colliculus
Olive

CEREBELLUM:

Cerebellar Peduncles
Folia

CEREBRAL HEMISPHERES:

LOBES (know boundaries):

Frontal
Parietal
Temporal
Occipital
Insular Cortex

DORSOLATERAL SURFACE:

Central Sulcus
Lateral (Sylvian) Sulcus
Superior, Middle, & Inferior Frontal Gyri
Precentral Gyrus
Broca's Area
Postcentral Gyrus
Inferior Parietal Lobule
Superior Parietal Lobule
Supramarginal Gyrus
Angular Gyrus
Superior, Middle, & Inferior Temporal Gyri
Heschl's Gyri

MEDIAL SURFACE:

Corpus Callosum
Cingulate Gyrus
Parieto-occipital Fissure
Calcarine Fissure

INFERIOR SURFACE

Orbital Cortex
Olfactory Bulb
Olfactory Tract
Occipitotemporal Gyrus
Collateral Sulcus
Parahippocampal Gyrus

Uncus

MENINGES:

Dura Mater

Subdural Space

Arachnoid Mater

Subarachnoid Space

Pia Mater

Arachnoid Villi

Arachnoid Granulations

Choroid Plexus

Cerebrospinal Fluid

CSF cisterns

VASCULATURE:

Anterior (Carotid) System

Posterior (Vertebro-basilar)

Circle of Willis

Dural Sinuses