Contents

Color Atlas of Brain

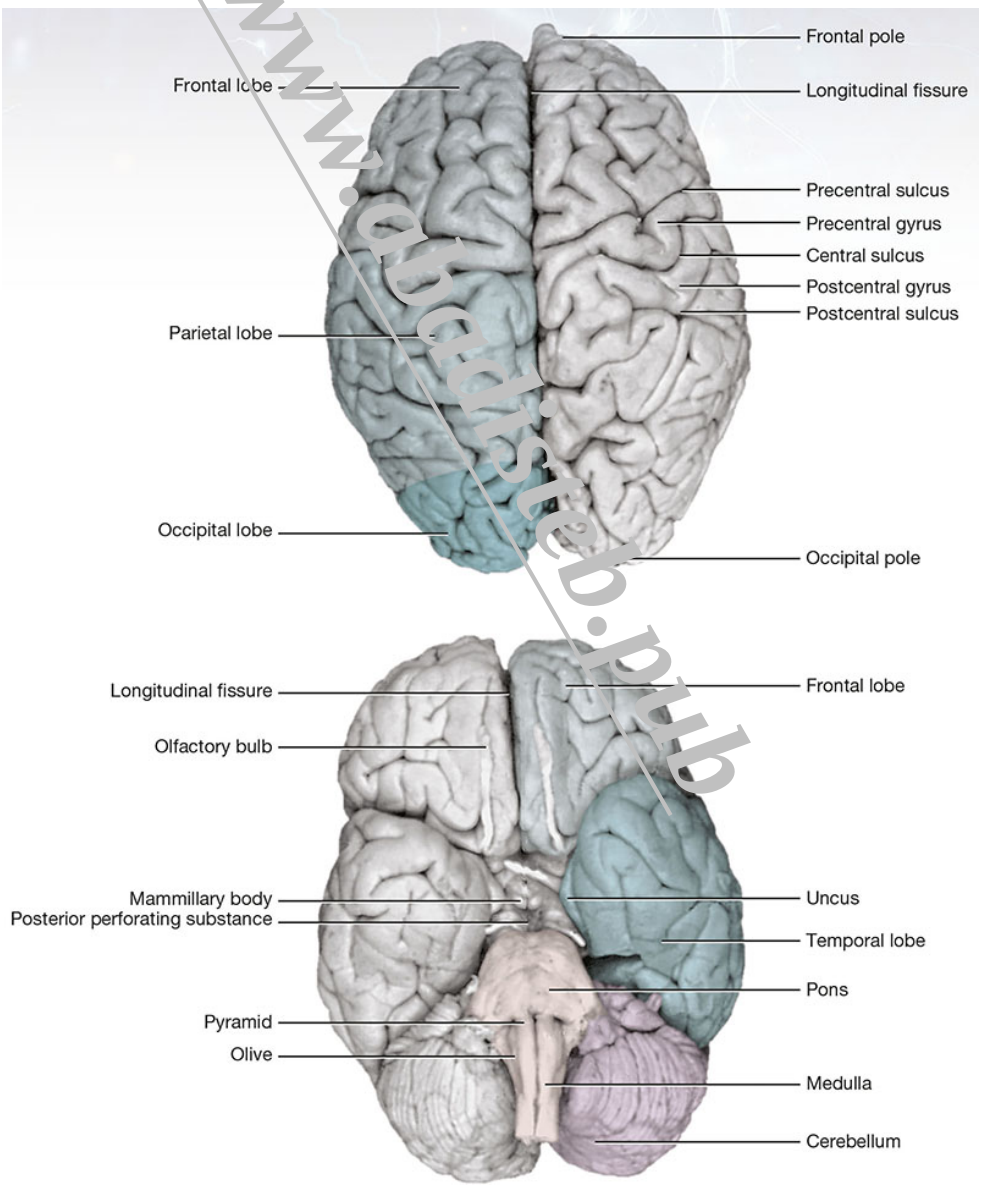

Figure CA-1 **Top:** Superior view of the brain. **Bottom:** Inferior view of the brain.

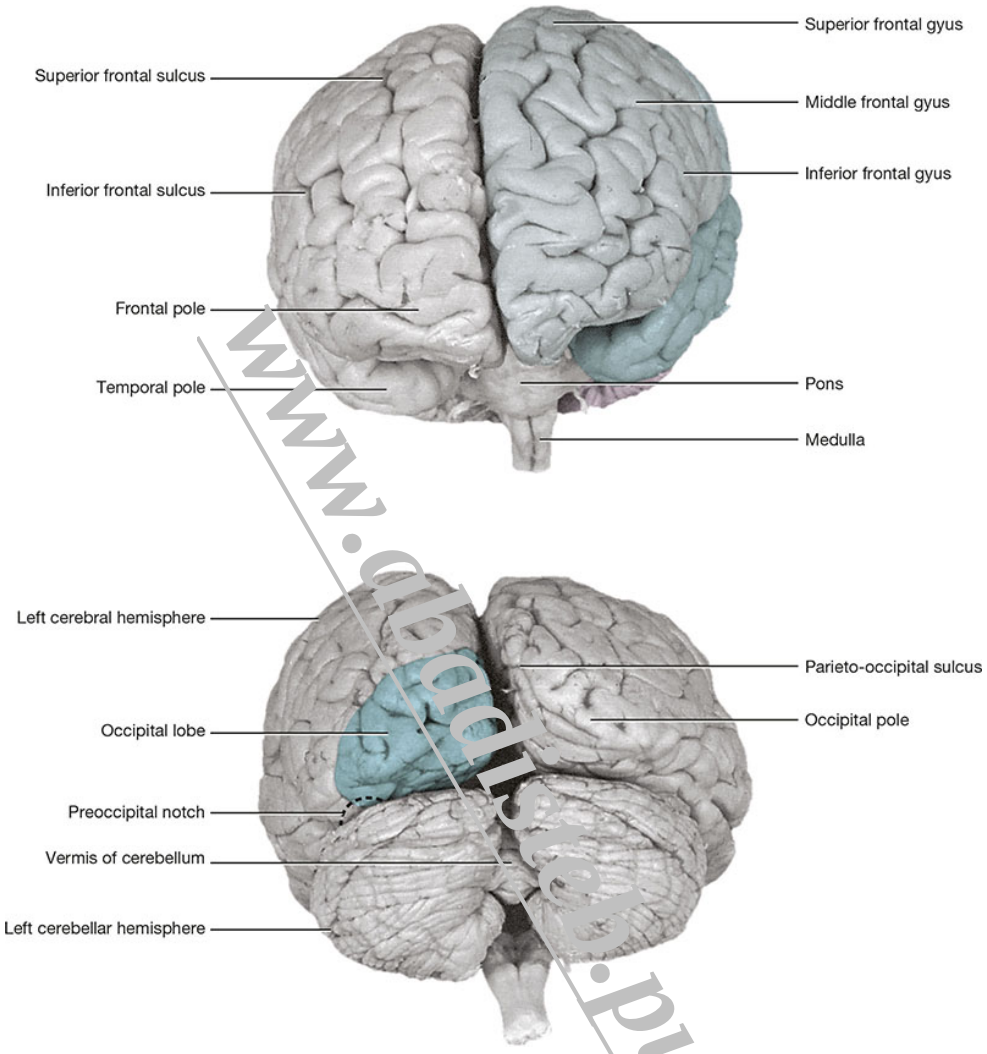

Figure CA-2 **Top:** Anterior view of the brain. **Bottom:** Posterior view of the brain.

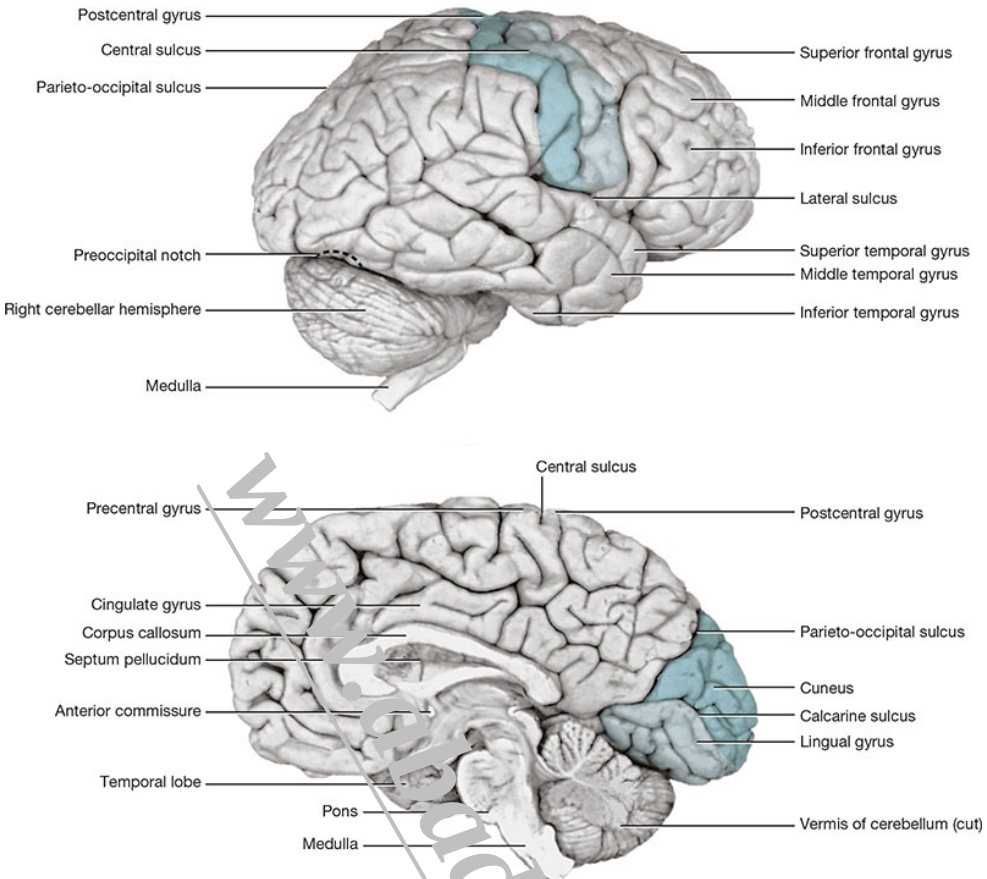

Figure CA-3 **Top:** Right lateral view of the brain. **Bottom:** Medial view of the right side of the brain following median sagittal section.

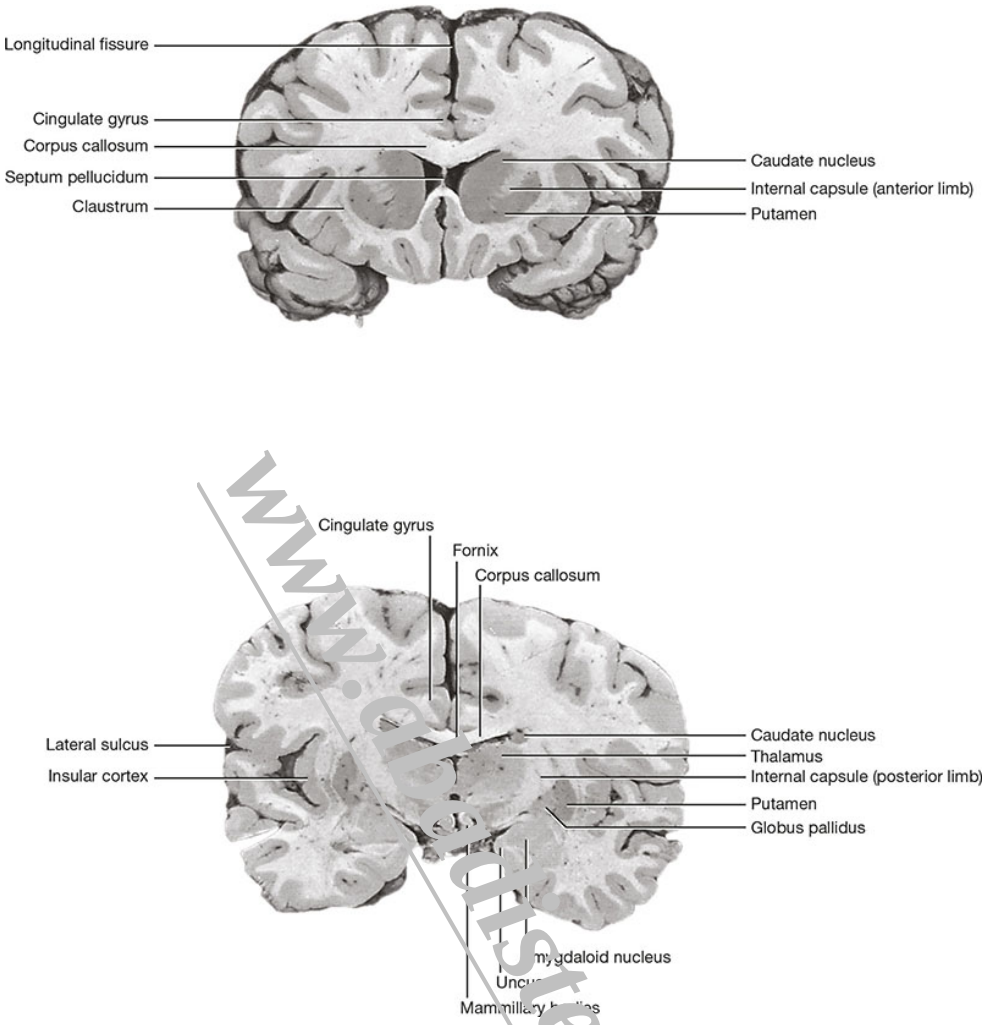

Figure CA-4 Coronal sections of the brain passing through the temporal pole **(top)**, the mammillary bodies **(bottom)**.

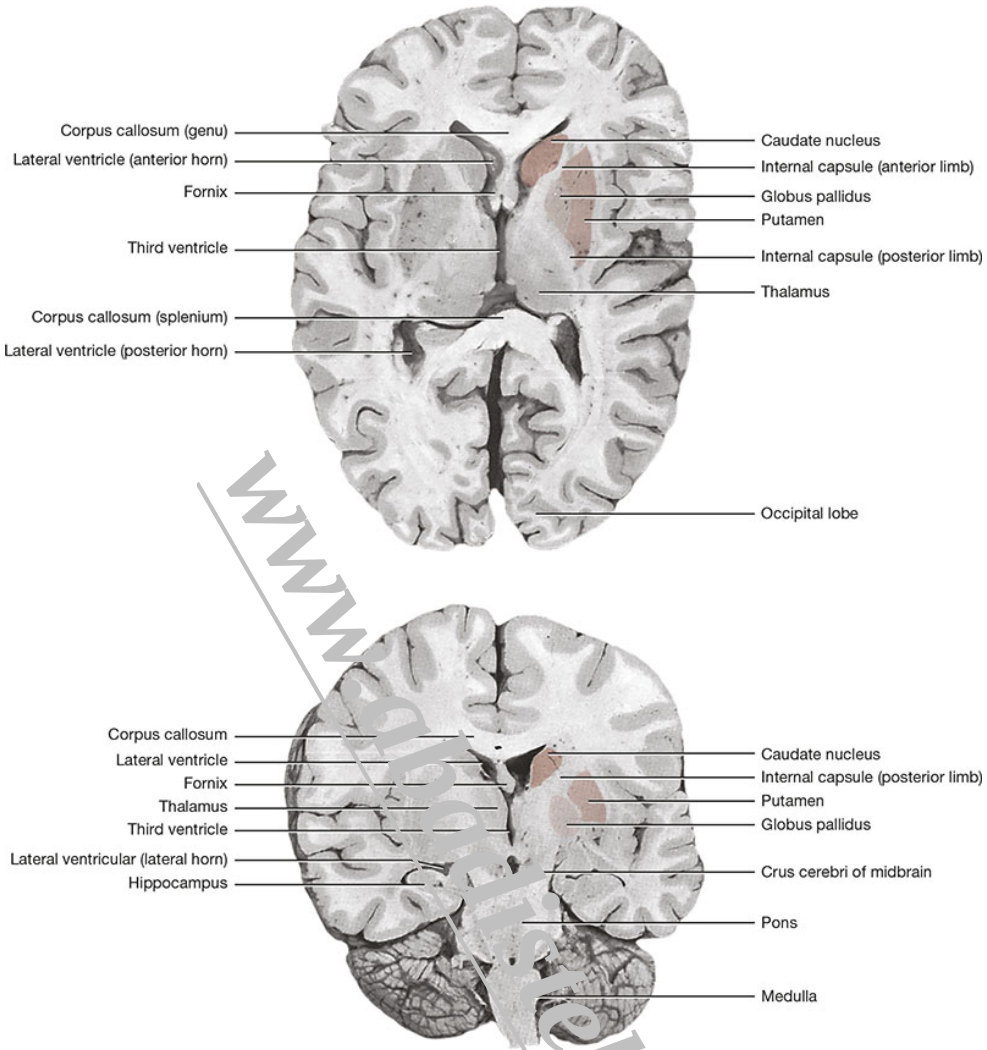

Figure CA-5 **Top:** Horizontal section of the cerebrum showing the lentiform nucleus, the caudate nucleus, the thalamus, and the internal capsule. **Bottom:** Oblique coronal section of the brain.

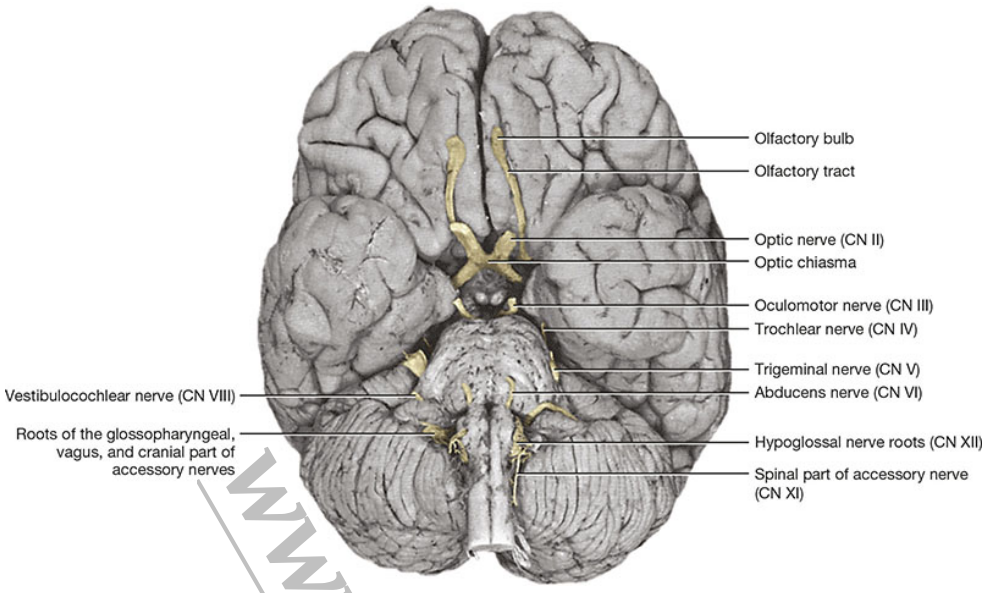

Figure CA-6 Inferior view of the brain showing cranial nerves. The facial nerves cannot be seen.

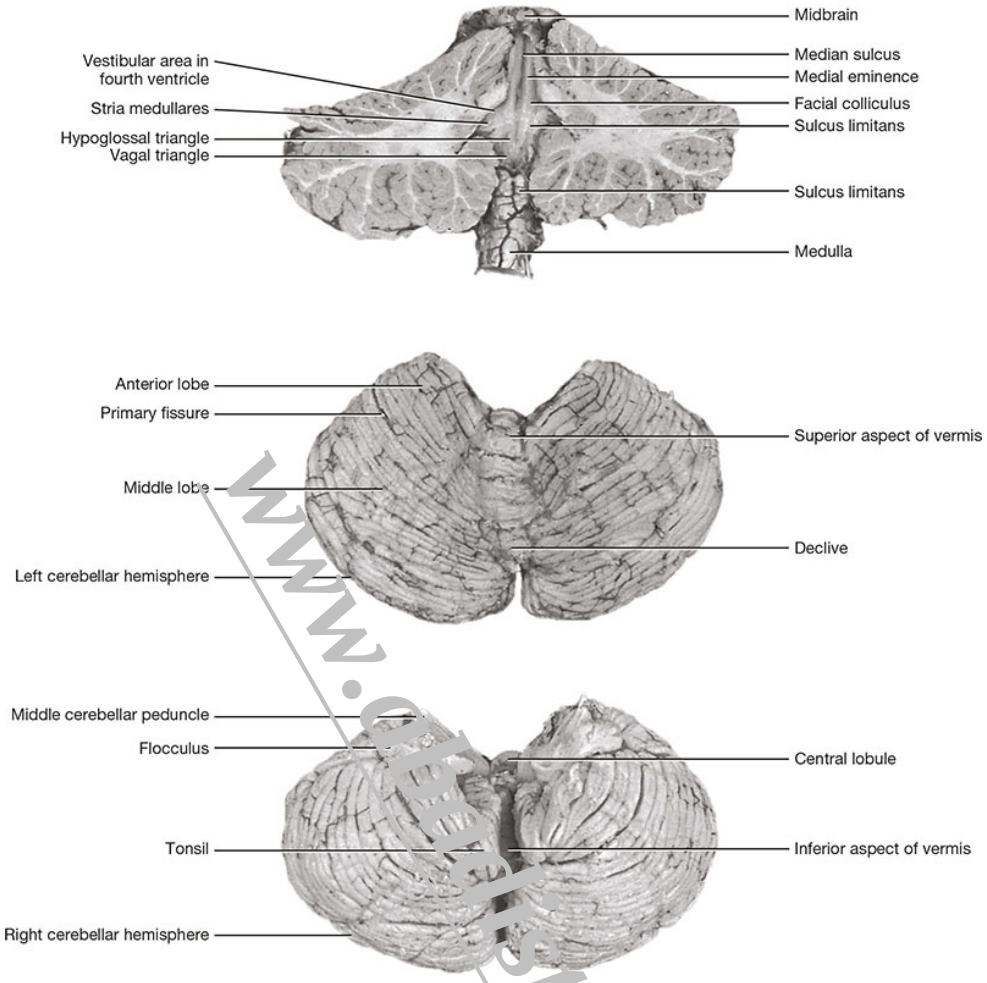

Figure CA-7 **Top:** Posterior view of the brainstem. The greater part of the cerebellum had been removed to expose the floor of the fourth ventricle. **Middle:** Superior view of the cerebellum showing the vermis and right and left cerebellar hemispheres. **Bottom:** Inferior view of the cerebellum showing the vermis and right and left cerebellar hemispheres.

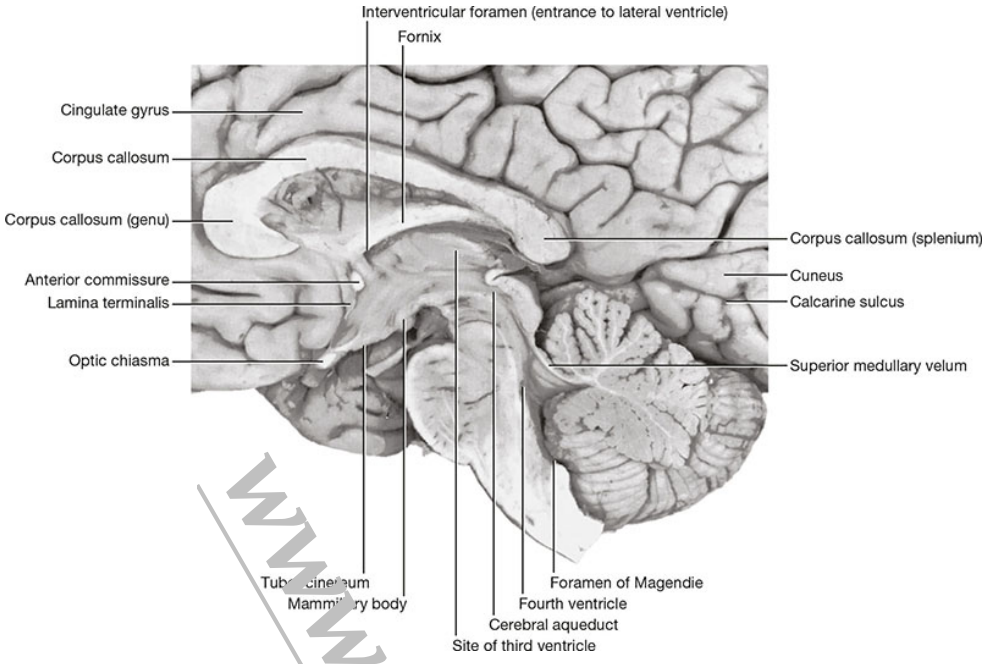

Figure CA-8 Enlarged medial view of the right side of the brain following median sagittal section, showing the continuity of the central canal, fourth ventricle, cerebral aqueduct, and the third ventricle and entrance into the lateral ventricle through the interventricular foramen.

1 Organization of the Nervous System

CHAPTER OBJECTIVES

- Understand the basic organization of the nervous system
- Gain a 3-dimensional appreciation of the parts of the brain and their relative positions to one another

A 23-year-old student is driving home from a party and crashes his car head-on into a tree. On examination, he has a fracture–dislocation of the seventh thoracic (T7) vertebra, with signs and symptoms of severe damage to the spinal cord. Later, he is found to have paralysis of the left leg. Cutaneous sensibility testing reveals a band of cutaneous hyperesthesia (increased sensitivity) extending around the abdominal wall on the left side at the level of the umbilicus. Just below this, he has a narrow band of anesthesia and analgesia. On the right side, he has total analgesia, thermoanesthesia, and partial loss of touch sensation of the skin of the abdominal wall below the level of the umbilicus and involving the entire right leg.

With knowledge of anatomy, a clinician knows that a fracture–dislocation of T7 can result in severe damage to the T10 spinal segment. Because of the small size of the vertebral foramen in the thoracic region, such an injury inevitably results in damage to the spinal cord. Knowledge of the vertebral levels of the various segments of the spinal cord enables the clinician to determine the likely neurologic deficits; the unequal sensory and motor losses on the 2 sides indicate left hemisection. The band of anesthesia and analgesia was caused by the destruction of the cord on the left side at the level of the T10 segment; all afferent nerve fibers entering the cord at that point were interrupted. The loss of pain and thermal sensibilities and the loss of light touch below the level of the umbilicus on the right side were caused by the interruption of the lateral and anterior spinothalamic tracts on the left side of the cord.

To comprehend what has happened to this patient, the relationship between the spinal cord and its surrounding vertebral column must be understood. The various neurologic deficits will be easier to understand after the reader has learned how the nervous pathways pass up and down the spinal cord. This information is discussed in Chapter 4.

The nervous system and the endocrine system control the functions of the body. The nervous system is composed of specialized cells whose basic function is to receive sensory stimuli and to transmit them to effector organs, whether muscular or glandular. The sensory stimuli that arise either outside or inside the body are

correlated within the nervous system, and the efferent impulses are coordinated so that the effector organs work harmoniously together for the well-being of the individual. In addition, the nervous system of higher species has the ability to store sensory information received during past experiences. This information, when appropriate, is integrated with other nervous impulses and channeled into the common efferent pathway.

CENTRAL AND PERIPHERAL NERVOUS SYSTEMS

As shown in Figure 1-1, the nervous system is divided into 2 main parts: the **central nervous system** (**CNS**), which consists of the brain and spinal cord, and the **peripheral nervous system** (**PNS**), which consists of the cranial and spinal nerves and their associated ganglia.

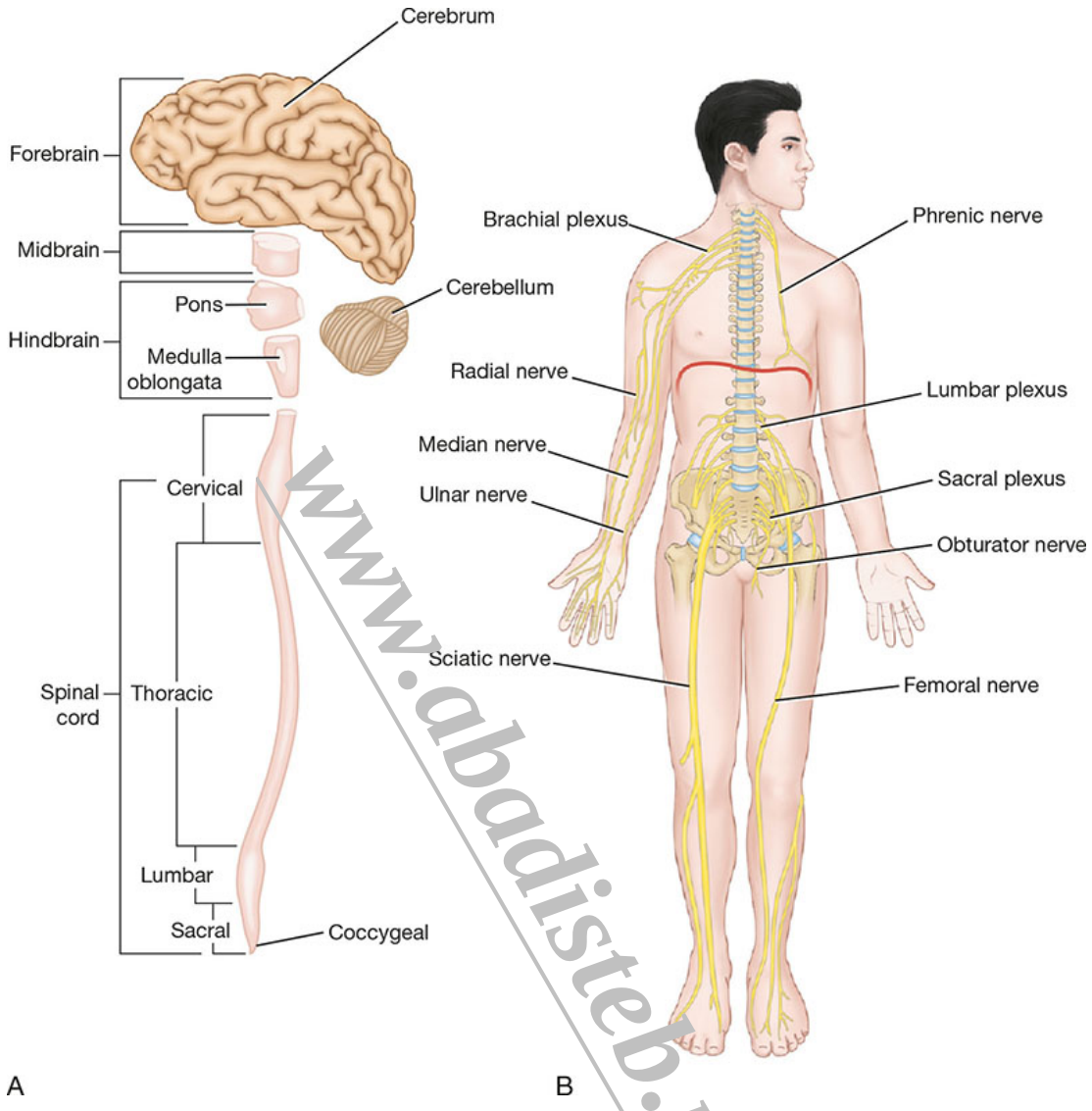

Figure 1-1 (**A**) Main divisions of the central nervous system. (**B**) Parts of the peripheral nervous system (cranial nerves have been omitted).

In the CNS, the brain and spinal cord are the main centers where correlation and integration of nervous information occur. Both the brain and spinal cord are covered with a system of membranes (**meninges**) and are suspended in **cerebrospinal fluid** (**CSF**). Meninges are further protected by the bones of the skull and the vertebral column (Fig. 1-2).