NEURO ANATOMY

(1)

1.1 Divisions of the Nervous System

The human nervous system, like the nervous systems of all *vertebrates* (i.e., animals with spines), has two major divisions: the **central nervous system** (CNS) and the **peripheral nervous system** (PNS). The central nervous system is the part of the vertebrate nervous system that is located within the spine and skull; the peripheral nervous system is the part of the vertebrate nervous system that is located outside the spine and skull. The primary function of the spine and skull is to protect the central nervous system from damage.

The PNS has two kinds of functions: *sensory* and *motor*. It conducts sensory signals to the CNS from sensory receptors in various parts of the body, and it conducts motor signals away from the CNS to muscles, glands and other *effector organs* (i.e., organs that are capable of action) in various parts of the body.

The functions of the CNS are more complex than those of the PNS. The CNS receives, stores, and analyzes the sensory signals conducted to it by the PNS, and on the basis of them, it generates the motor signals that are conducted by the PNS to the effector organs.

The spine is composed of 33 *vertebrae* (i.e., spinal bones). It is divided into four different regions: (1) the **cervical region** includes the vertebrae of the cervix or neck, (2) the **thoracic region** includes the vertebrae of the thorax or chest, the vertebrae to which the ribs are attached, (3) the **lumbar region** includes the vertebrae of the small of the back, and (4) the **sacral region** includes the vertebrae of the lower back, the vertebrae to which the bones of the pelvis are attached. In humans, the vertebrae of the sacral region fuse at about the age of 26 years and become known as the *sacrum*.

Central nervous system (CNS)
The part of the vertebrate nervous system that is located within the skull and spine.

Peripheral nervous system (PNS)
The part of the vertebrate nervous system that is located outside the skull and spine.

Cervical region (SIR vi cal)
The section of the spine that provides the flexible framework of the neck or cervix; it lies between the skull and the thoracic region.

Thoracic region (thor ASS ic)
The section of the spine to which the ribs are attached; it lies between the cervical and the lumbar regions.

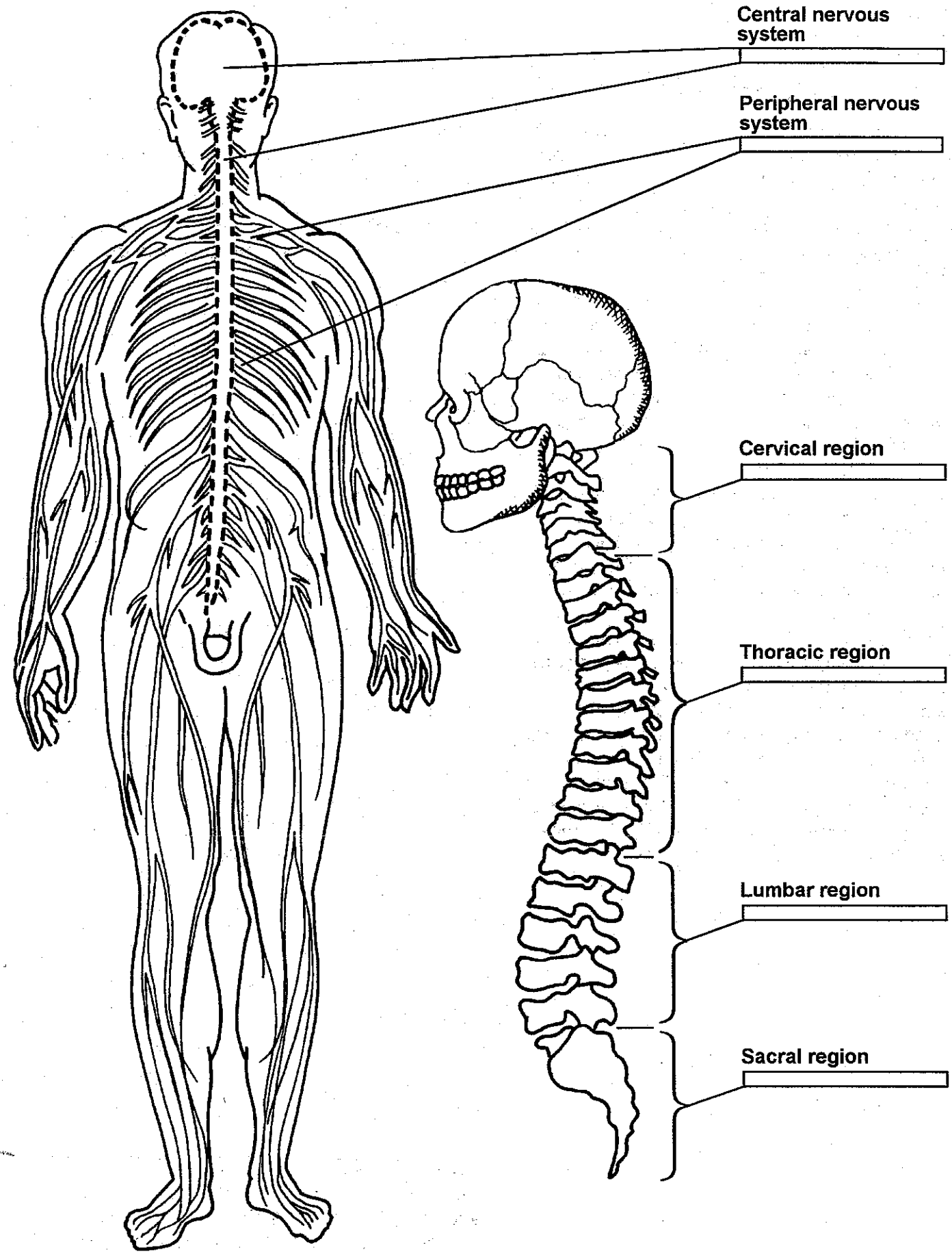
Lumbar region (LUM bar)
The section of the spine that supports the small of the back; it lies between the thoracic region and the sacral region.

Sacral region (SAK rul)
The section of the spine to which the bones of the pelvis are attached; it lies adjacent to the lumbar region.

Coloring notes

First, in the illustration of the human figure, color the central nervous system (brain and spinal cord) one color and all branches of the PNS, including those that are represented by single lines, another color. Then, in the illustration of the skull and spinal cord, color each region of the spine a different color.

In all learning units, color the bars under the terms in the right margin; use the same colors as you use for the structures to which they point.


Central nervous system
Peripheral nervous system
Cervical region
Thoracic region
Lumbar region
Sacral region

5.1 Cerebral Hemispheres and Brain Stem

The human brain has three components: the two **cerebral hemispheres** and the **brain stem**. The two cerebral hemispheres sit atop the brain stem, which is an extension of the spinal cord.

In general, the structures of the human cerebral hemispheres mediate complex psychological processes such as memory, motivation, speaking, and thinking. In contrast, brain stem structures control simple bodily reflexes, many of which maintain the constancy of the body's internal environment—for example, brain stem structures regulate blood glucose and oxygen levels, heart rate, and body temperature.

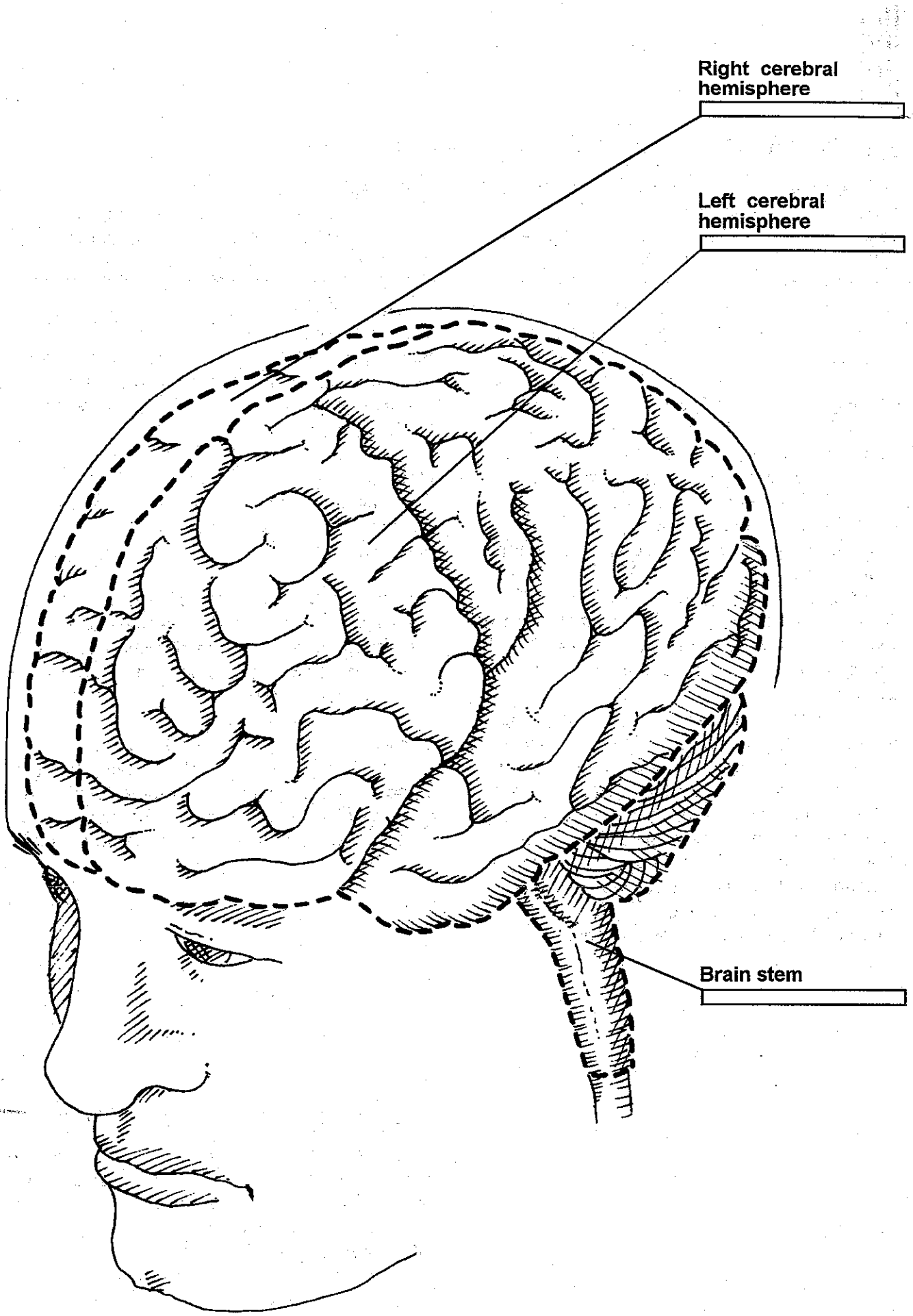
During the course of vertebrate evolution, the cerebral hemispheres have undergone massive development. Virtually nonexistent in early vertebrates (i.e., in fish, amphibians, and reptiles), the cerebral hemispheres constitute the largest, most complex division of the primate brain. In contrast, the vertebrate brain stem has undergone little recent evolutionary development—there is little difference between the primate brain stem and the brain stems of early vertebrates.

Cerebral hemispheres (se REE brul HEM iss feers)
The two large neural structures that sit atop the vertebrate brain stem, one on the left and one on the right; they mediate complex psychological processes.

Brain stem
The central neural stem on which the two cerebral hemispheres sit; many brain stem structures play key roles in the regulation of the body's inner environment.

Coloring notes

Color the left hemisphere, right hemisphere, and brain stem different colors by staying within the dashed lines.


Right cerebral hemisphere
Left cerebral hemisphere
Brain stem

7.2 Lobes of the Cerebral Hemispheres

Each human cerebral hemisphere is divided by the *central fissure* and *lateral fissure* into four *lobes:* (1) At the anterior end of each cerebral hemisphere, anterior to the central fissures and anterior and superior to the lateral fissures, are the **frontal lobes**. (2) At the top of each hemisphere, just posterior to the central fissures and superior to the lateral fissures, are the **parietal lobes**. (3) At the bottom of each hemisphere, inferior to the lateral fissures, are the **temporal lobes**. (4) And lastly, at the posterior pole of each hemisphere, posterior to the parietal and temporal lobes, are the **occipital lobes.**

It is important to understand that the lobes of the cerebral hemispheres are not functional units. The cerebral cortex is composed of many areas, each of which performs specific functions and has distinctive structural features; however, the boundaries of these functional units do not follow the boundaries between the lobes—the location of the major fissures is arbitrary with respect to cortical function. Each lobe is composed of many functional units, and many functional units lie across the boundaries of adjacent lobes. Accordingly, although knowing the general location of the four pairs of cerebral lobes is useful in describing the location of specific functional areas within the cerebral hemispheres, each hemisphere does not have a specific function.

Frontal lobes
The two regions of the cerebral hemispheres, one in each hemisphere, that are anterior to the central fissures.

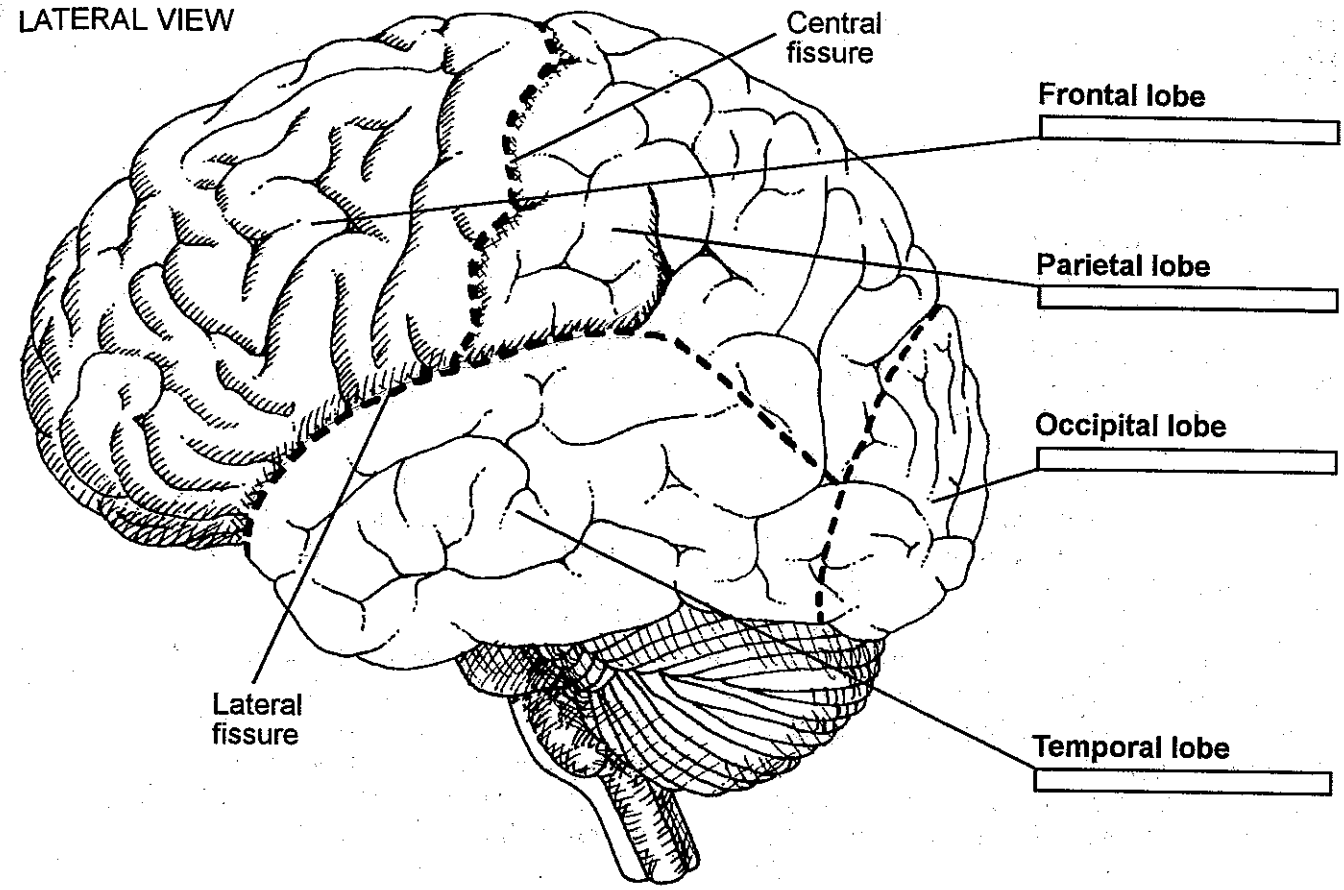
Parietal lobes (pa RYE e tal)
The two regions of the cerebral hemispheres, one in each hemisphere, that are posterior to the central fissures and superior to the lateral fissures.

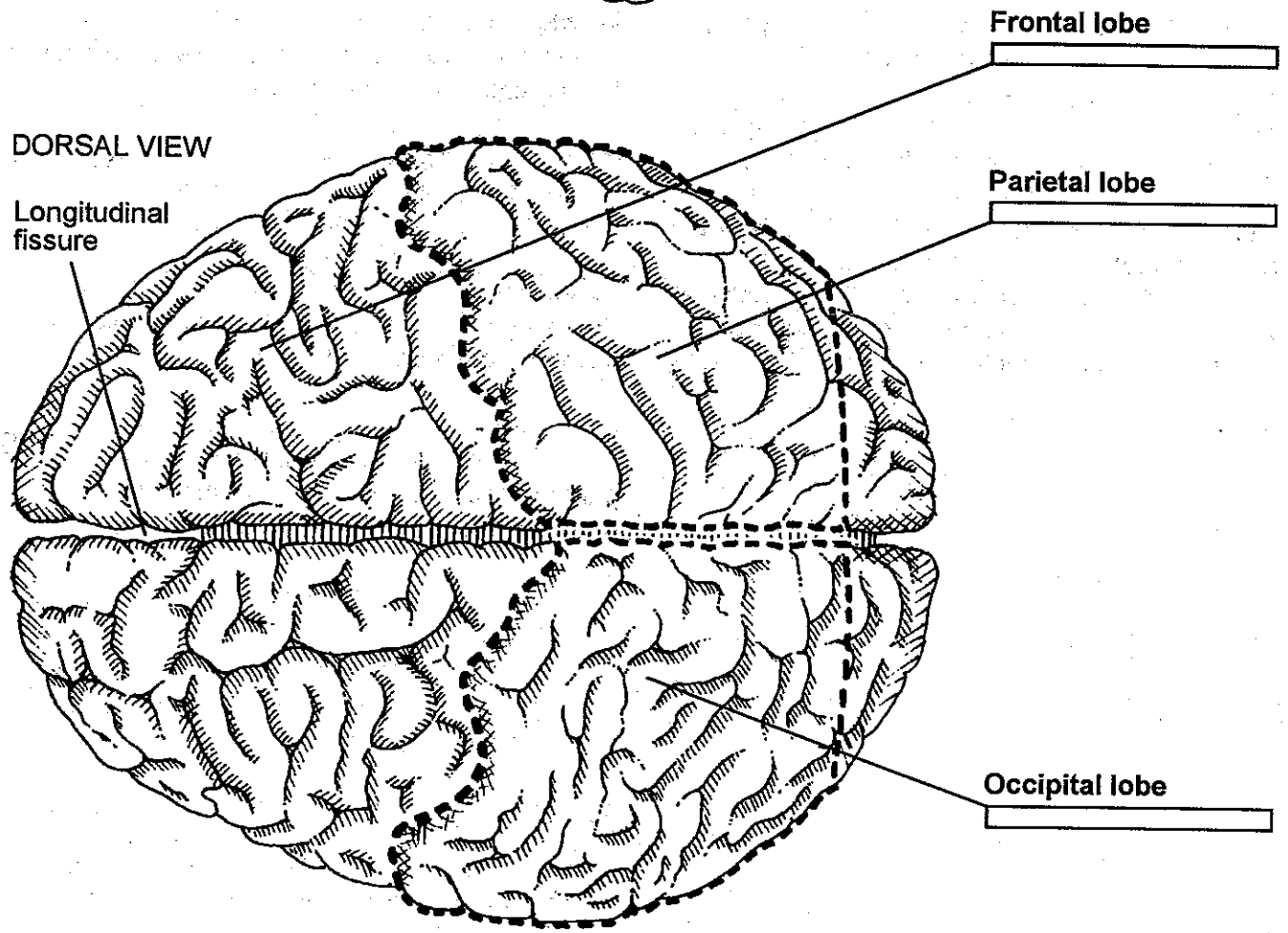
Temporal lobes
The two regions of the cerebral hemispheres, one in each hemisphere, that are inferior to the lateral fissures.

Occipital lobes (ok SIP i tal)
The two regions of the cerebral hemispheres that are at the posterior pole of each hemisphere.

Coloring notes

First, color the temporal, frontal, parietal, and occipital lobes in the upper illustration. Then, using the same colors as you used in the upper view, color the frontal, parietal, and occipital lobes in the lower illustration.


LATERAL VIEW
Central fissure
Frontal lobe
Parietal lobe
Occipital lobe
Lateral fissure
Temporal lobe


Frontal lobe
DORSAL VIEW
Parietal lobe
Longitudinal fissure
Occipital lobe