Chapter 9-3: The Nervous System

The nervous system enables the body to adjust to changes in the outside environment and within the body. Sensing stimuli and conveying them to the brain and spinal cord, the nervous system makes analysis and coordination by the body possible. Messages from the brain are then conveyed via the nerves to the glands and muscles.

This plate lays out the general pattern of the nervous system. We will point out the major divisions and subdivisions of the system and explain their various functions.

> Notice that we show the nervous system and several organ systems that are associated with it, and affected by it. We used brackets to set apart the major divisions of the nervous system. We also use subscript numbers to indicate related parts of the system and small letters to indicate organs that are associated with, but not an integral part of, the nervous system.

The nervous system is a single, unified network of communications, but on an anatomical basis, it is divided into two primary portions. The first portion we'll mention is the **central nervous system (A)**, or CNS, and the second is the **peripheral nervous system (B)**, or PNS. The brackets should be colored in bold colors.

The two key components of the central nervous system are the **brain (C)** and the **spinal cord (D)**. The spinal cord is a continuation of the stem of the brain, so you should use the same color for them.

The brain and spinal cord constitute the central control system of the body. The tissue of these organs receives and interprets stimuli, then dispatches impulses to glands and muscles. Higher mental faculties are centered in the brain, while many automatic reflex actions take place in the spinal cord.

> We now focus on the second portion of the nervous system, the peripheral nervous system, which has two major divisions and several subdivisions. Bold colors may be used to indicate the pathway of nerves, and the organs should be colored in light colors to preserve their detail.

The nerves associated with the brain and spinal cord make up the peripheral nervous system; they allow the brain and spinal cord to communicate with the remainder of the body.

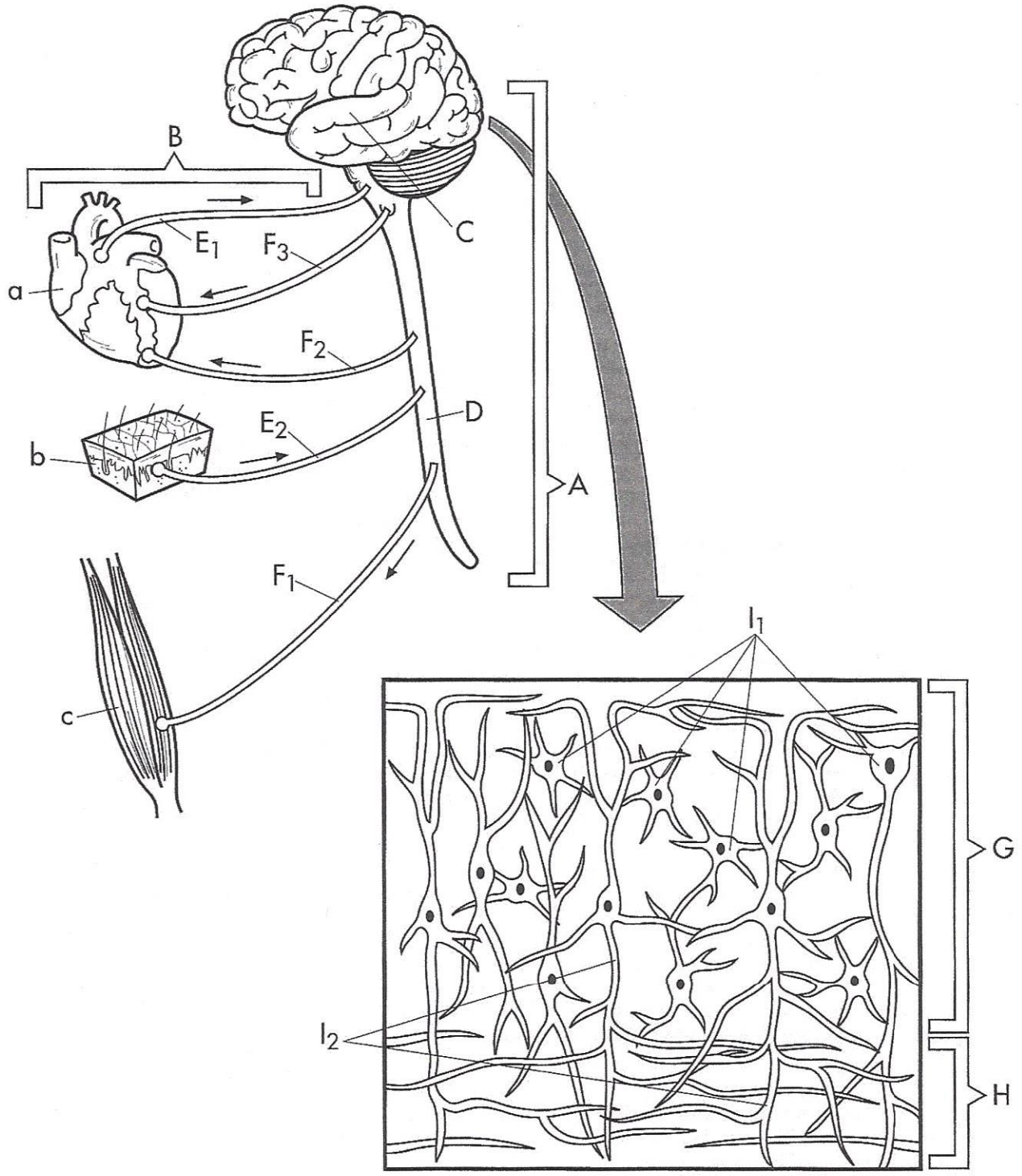
There are two major divisions of the peripheral nervous system. The first is the sensory division. Nerves in this division transmit impulses from the various organs and from the surface of the body. Nerve impulses that carry impulses from body organs are called **visceral sensory nerves (E_1)**; you should now color the visceral sensory nerve that leads from the **heart (a)** to the CNS. Another component of the sensory division is the **somatic sensory nerves (E_2)**, which transmit nerve impulses from the body surface. A **skin section (b)** is also shown in the plate, and we recommend that you color it a bold color.

The second major division of the peripheral nervous system is the motor division, which itself has two subdivisions. The first is the somatic subdivision, which is a system of nerve fibers that carry impulses from the CNS to the skeletal muscle. A **somatic motor nerve (F_1)** is shown carrying impulses to the **skeletal muscle (c)**.

The second subdivision of the motor division is the autonomic subdivision. This is sometimes called the autonomic nervous system, and it has two parts. The sympathetic nervous system transmits impulses that stimulate organs. A **sympathetic nerve (F_2)** is shown extending to the heart from the spinal cord. The second part is called the parasympathetic nervous system. We show a **parasympathetic nerve (F_3)** that extends to the heart from the spinal cord. The activity of parasympathetic nerves opposes that of sympathetic nerves.

> Finally, let's take a brief look at the tissue of the brain and the organization of the nerve cells. As you continue to read, locate the structures in the plate and color them.

The functional cells of the nervous system are called neurons, or nerve cells. In the plate, we show a small section of brain tissue. Toward the surface of the brain is the area made up of **gray matter (G)**, and within this gray matter are **cell bodies (I_1)** of neurons. The next layer in from the gray matter is **white matter (H)**. White matter consists primarily of extensions of the cell bodies called **axons (I_2)**. We will talk a little about how nerve impulses are transmitted in the next plate.



The Nervous System

- ○ Central Nervous System .....A
- ○ Peripheral Nervous System .....B
- ○ Brain.....C
- ○ Spinal Cord.....D
- ○ Visceral Sensory Nerves .....E_1
- ○ Somatic Sensory Nerves .....E_2
- ○ Somatic Motor Nerve ..F_1
- ○ Sympathetic Nerve ....F_2
- ○ Parasympathetic Nerve .....F_3
- ○ Gray Matter.....G
- ○ White Matter .....H
- ○ Cell Bodies .....I_1
- ○ Axons .....I_2
- ○ Heart.....a
- ○ Skin Section .....b
- ○ Skeletal Muscle.....c