Nervous System

Unit 6.6 (6th Edition)
Chapter 7.6 (7th Edition)
Learning Objectives

• Identify the main parts (anatomy) of a neuron.
• Identify the 2 divisions of nervous system.
• Classify the major types of nerves.
• Describe the function (physiology) of each of the 6 main parts of the brain.
• Explain 3 functions (physiology) of spinal cord.
• Name the 3 meninges.
• Contrast the actions of the sympathetic and parasympathetic nervous systems.
• Describe major diseases of the nervous system.
Fun Facts About the Nervous System

• The nervous system is a complex, highly organized system that coordinates all activities in the body.
• The nervous system allows the body to change/adapt.
• The left side of your brain controls the right side of your body.
• The right side of your brain controls the left side of your body.
• There are ~ 100 billion neurons in the human brain.
• The average speed of a signal transferred through a neuron is 1.2-250 miles per hour.
• If you lined up all of the neurons in the human body, they would stretch 600 miles!
Neurons

- Neurons
  - basic structural unit of nervous system
- Dendrites
  - nerve fibers that carry impulses toward the cell body
- Axon
  - single nerve fiber that carries impulses away from the cell body
- Synapses
  - spaces between axon of one neuron & dendrite of other neurons
- Neurotransmitters
  - chemicals at the end of each axon that allow nerve impulses to travel
Nerves

- Nerves
  - combination of many nerve fibers (cells) outside the brain and spinal cord
- Afferent (Sensory) Nerves
  - carry messages from all parts of the body to the brain and spinal cord
- Efferent (Motor) Nerves
  - carry messages from the brain and spinal cord to the muscles and glands
- Associative (Internuncial) Nerves
  - carry both sensory and motor messages
Two Divisions of Nervous System

- Central Nervous System
  - brain and spinal cord
- Peripheral Nervous System
  - consists of nerves
  - subdivided into 2 parts
    1. Autonomic Nervous System - controls involuntary body functions
    2. Somatic Nervous System - carries messages between central nervous system & body
Central Nervous System

• Brain
  – mass of nerve tissue protected by membranes & skull
  – divided into six main parts (discussed below)

• Cerebrum
  – largest and highest section of brain
  – separated into lobes
  – reasoning, thought, memory, speech, sensation, sight, smell, hearing, and voluntary body movement

• Cerebellum
  – section below back of cerebrum
  – muscle coordination, balance, posture, & muscle tone
Brain Components Continued

• Diencephalon
  – between cerebrum and midbrain
  – regulates temperature, appetite, water balance, sleep, blood vessel constriction and dilation
  – emotions: anger, fear, pleasure, pain, & affection

• Midbrain
  – located below cerebrum at top of brain stem
  – conducts impulses between brain parts
  – certain eye and auditory reflexes

• Pons
  – below midbrain and in brain stem
  – conducts messages to other parts of brain
  – reflex actions: chewing, tasting, saliva, & respiration

• Medulla Oblongata
  – lowest part of brain stem that connects with spinal cord
  – regulates heartbeat, respiration, swallowing, coughing, BP
Spinal Cord

- Spinal Cord
  - continues down from medulla oblongata
  - ends at first or second lumbar vertebrae
  - surrounded and protected by vertebrae
  - responsible for reflex actions
  - carries sensory (afferent) messages up to the brain
  - carries motor (efferent) messages from brain to the nerves that go to muscles and glands

- Meninges
  - three membranes that cover & protect brain & spinal cord
  - dura mater is thick, tough outer layer
  - arachnoid is middle layer, delicate and weblike
  - pia mater is closely attached to brain and spinal cord and contains blood vessels that nourish nerve tissue
Peripheral Nervous System

• Somatic Nervous System
  – 12 pairs of cranial nerves
  – 31 pairs of spinal nerves and their branches
  – each nerve goes directly to a particular part of the body
    or networks with other spinal nerves & forms plexus

• Autonomic Nervous System
  – maintains balance in involuntary functions
  – allows body to react in emergencies
  – sympathetic nervous system-in emergencies, increases
    heart rate, respiration, and BP (fight or flight)
  – parasympathetic nervous system-after emergencies
    counteracts by slowing heart rate, lowering BP, etc.
Diseases & Abnormal Conditions

• Meningitis
  – inflammation of the linings of the brain and spinal cord
• Encephalitis
  – inflammation of the brain caused by germ or chemicals
• Epilepsy
  – seizure disorder caused by excessive discharge from neurons
  – 1 in 200 suffer grand mal or petit mal seizures
• Cerebral Palsy
  – disturbance in voluntary muscular action caused by brain damage
• Parkinson’s Disease
  – decreased neurotransmitter results in tremors
  – usually after age 50
Diseases & Abnormalities Continued

• Cerebrovascular Accident (CVA)
  – also called stroke
  – when blood flow to brain is impaired & destroys brain tissue

• Hydrocephalus
  – excessive accumulation of cerebrospinal fluid in brain

• MS (Multiple Sclerosis)
  – chronic, disabling condition resulting from degeneration of myelin sheath
  – occurs between ages of 20-40
  – there is no cure

• Paralysis
  – Results from brain or spinal cord injury that destroys neurons
  – Results in loss of function below the level of the injury