

# Chapter 7: The Nervous System

## Lesson 1: How the Nervous System Works

### What is the Role of the Nervous System?

Your nervous system receives information about what is happening both inside and outside your body. It directs how your body responds to this information. In addition, your nervous system helps maintain homeostasis.

### Receiving Information

- Nervous system makes you aware of what is happening around the body.

Example: \_\_\_\_\_

- Also checks conditions inside your body.

Example: \_\_\_\_\_

### Responding to Information

- STIMULUS: any change or signal in the environment that an organism can recognize and react to.

Example: \_\_\_\_\_

- RESPONSE: a reaction to a stimulus

Example: \_\_\_\_\_

\* Some responses are voluntary and some are involuntary.

### Maintaining Homeostasis

- Maintains homeostasis by directing your body to respond properly to information it receives.

Example: \_\_\_\_\_

### What is a Neuron?

Cells that carry information through your nervous system are called NEURONS or NERVE CELLS.

- NERVE IMPULSE: the message that a neuron carries.

#### Structure

Neuron structure allows the neuron to carry nerve impulses.

Neuron has a large cell body that contains the nucleus, dendrites, and axon.

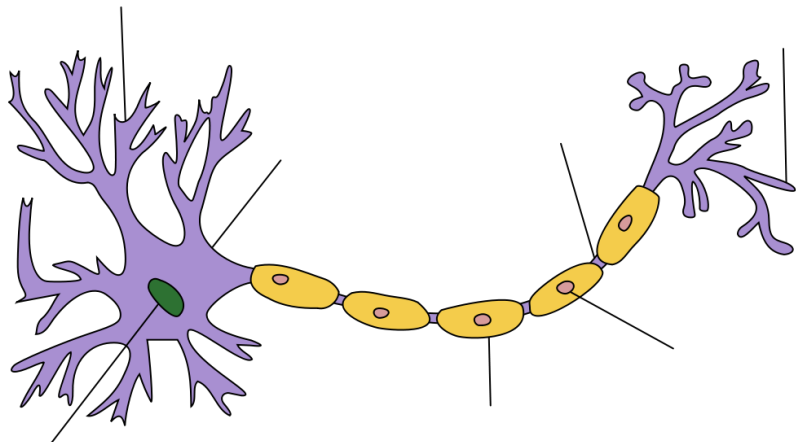
DENDRITE: a branchlike structure that picks up impulses.

AXON: the long structure leading away from the cell body.

- Sends impulses away from the cell body to axon tips at end of neuron.

- Axons make up nerve fibers. Nerve fibers make up nerves.

NERVE: a bundle of nerve fibers.



## Kinds of Neurons

- 1) **SENSORY NEURON:** picks up a stimulus and converts it into a nerve impulse, sending it to interneuron.
- 2) **INTERNEURON:** Carries a nerve impulse to another interneuron or to a motor neuron and usually located in the brain.
- 3) **MOTOR NEURON:** sends an impulse to a muscle or gland, enabling it to respond.

## How Do Nerve Impulses Travel

- Every nerve impulse begins in dendrites, then moves towards neuron's body, then down axon until it reaches tip.

- Travels in the form of an electrical or chemical signal.

**SYNAPSE:** the place where a neuron transfers an impulse to another structure.

- At the axon tips, electrical signals change to a chemical form, allowing the message to cross the gap in the synapse.

Example: \_\_\_\_\_

## Lesson 2: Divisions of the Nervous System

### What is the Role of the Central Nervous System?

- **CENTRAL NERVOUS SYSTEM (CNS):** includes the brain and spinal cord and acts like a traffic cop.

- **PERIPHERAL NERVOUS SYSTEM (PNS):** includes all the nerves outside of the central nervous system, like car drivers.

### How the CNS works

- Controls the functions of the body

- **BRAIN:** the control center.

- **SPINAL CORD:** a thick column of nervous tissue that links the brain to the PNS.

Most impulses from PNS travel through the spinal cord to get to brain.

### The Brain

- Brain has about 100 billion neurons.

- Three layers of connective tissue under the skull cover the brain with fluid filling the space between the layers. → There for protection of the brain!

- Brain includes three major parts

1) **BRAIN STEM:** controls your body's involuntary actions.

Example: \_\_\_\_\_

2) **CEREBELLUM:** coordinates your muscle actions and helps you keep your balance.

3) **CEREBRUM:** Interprets input from your senses, controls movement, and carries out complex mental processes such as learning and remembering.

- Divided into left and right side.

- Right controls left side of body

- Left controls right side of body



## The Spinal Cord

- Vertebral column surrounds and protects the spinal cord along with spinal fluid and layers of connective tissue.

## What is the Role of the PNS?

- The PNS is a network of nerves that branches out from the CNS and connects it to the rest of the body. The PNS is involved in both involuntary and voluntary actions.  
- 43 pairs of nerves (12 pairs begin in brain, 31 pairs begin in spinal cord)

## Somatic and Autonomic Systems

- PNS has two groups of nerves

1) SOMATIC NERVOUS SYSTEM: controls voluntary actions.

Example: \_\_\_\_\_

2) AUTONOMIC NERVOUS SYSTEM: controls involuntary actions.

Example: \_\_\_\_\_

REFLEX: an autonomic response that occurs rapidly without conscious control.

Example: \_\_\_\_\_

## What Are Two Nervous System Injuries?

- Concussions and spinal cord injuries are two ways in which the central nervous system can be damaged.  
- CONCUSSION: occurs when the soft tissue of the brain is bruised as it collides against the skull.  
- Happen when you bump your head.  
- Can cause headache, confusion or loss of consciousness.  
- If spinal cord is cut or crushed, impulses cannot be passed through axons.  
- Can result in paralysis → loss of movement in part of the body.

## Lesson 3: Sight and Hearing

### How Do You See?

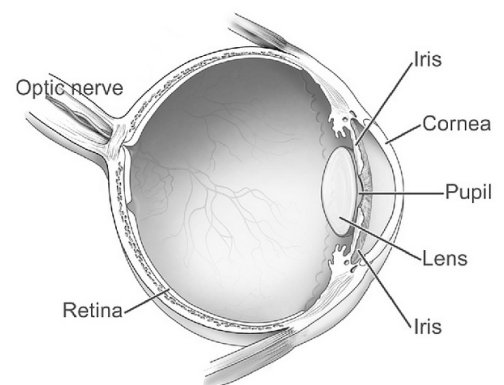
- Your eyes respond to the stimulus of light. They convert that stimulus into impulses that your brain interprets enabling you to see.

### How Light Enters Your Eye

- CORNEA: clear tissue that covers the front of the eye (first place light strikes).  
- PUPIL: the opening through which light enters the eye.  
- Size of pupil can be adjusted by muscles in the iris.  
- IRIS: a circular structure that surrounds the pupil and regulates how much light enters the eye.  
- Also gives eye its color.

LENS: a flexible structure that focuses light.

RETINA: line the back of the eye and contain light sensitive cells.



## How You See an Image

- Muscles attached to the lens adjust shape and focus light rays on the retina.
  - Produces an image that is upside down and reversed
- Retina contains ~ 130 million receptor cells that respond to light
  - Two kinds → Rods and Cones
    - 1) Rods: work best in dim light and allow you to see black, white and shades of gray.
    - 2) Cones: work best in bright light and allow you to see colors
- When light hits rods and cones nerve impulses travel to cerebrum through optic nerves.
  - Cerebrum flips images and combines the images from both eyes for complete picture.

## Correcting Vision

- NEARSIGHTEDNESS: people can see nearby objects clearly but not distant objects
  - Eyeball is too long
- FARSIGHTEDNESS: people can see distant objects clearly, but not nearby objects
  - Eyeball is too short.

## How Do Your Ears Work?

- Ears are the sense organs that respond to the stimulus of sound. An ear converts sound into nerve impulses that your brain interprets. Also, structures in your inner ear help to control your balance.

## How Sound is Produced?

- Most sounds are caused by vibrations of air particles.
  - Move in waves like stone being dropped in a pond.

## The Outer Ear

- Funnel- shaped part of ear that gathers sound waves that travel down the ear canal.

## The Middle Ear

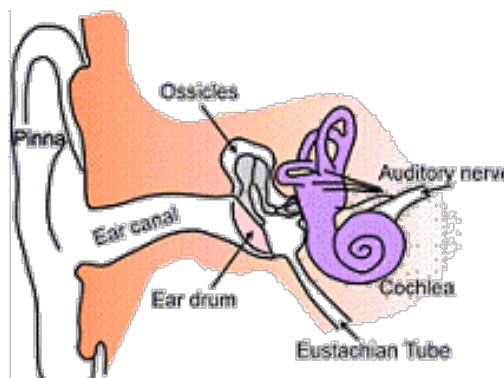
- EARDRUM: part of middle ear that is a membrane that vibrates when sound waves strike it.
  - Vibrations pass to hammer, anvil, and stirrup (small bones named for their shapes).

## The Inner Ear

- Stirrup vibrates against thin membrane that covers the opening of inner ear.
- COCHLEA: a small-shaped tube filled with fluid and lined with sound receptor cells.
  - When fluid vibrates, receptors are stimulated.
  - Sensory neurons send nerve impulses to cerebrum via auditory nerve.

## The Inner Ear and Balance

- SEMICIRCULAR CANALS: located above cochlea in inner ear and help your CNS maintain your balance.
  - Filled with fluid that moves when head moves.
  - Sends information to the brain about body motion and position



## Lesson 4: Smell, Taste, and Touch

### How Do Smell and Taste Work Together?

- TASTE BUDS: sensory receptors on your tongue.
- The senses of smell and taste work together. Both depend on chemicals in the air or in food. The chemicals trigger responses in receptors in the nose and mouth.
  - Nerve impulses then travel to the brain and are interpreted as smell or taste.
- Nose can distinguish 50 basic odors!
- Only 5 taste sensations
  - 1)
  - 2)
  - 3)
  - 4)
  - 5)

### How Do You Sense Touch?

- Your skin has different kinds of touch receptors that respond to stimuli.
  - Light touch: located in upper part of the dermis.
  - Textures: located in upper part of the dermis.
  - Heavy pressure: located deep in the dermis.
  - Temperature
  - Pain

## Lesson 5: Alcohol and Other Drugs

### How Does Drug Abuse Affect the Body?

- DRUG: any chemical taken into the body that causes changes in a person's body or behavior.  
Examples: \_\_\_\_\_

DRUG ABUSE: the deliberate use of a drug for nonmedical purposes or the use of an illegal drug.

- Medicines can be abused drugs if used in nonmedical, unintended ways.
- Many abused drugs are illegal.
- Drug abuse is dangerous because of its immediate effects on the brain and other parts of the nervous system. In addition, long-term drug abuse can lead to addiction and other health and social problems.

### Effects of Abused Drugs

- Variety of effects → Nausea, irregular heartbeat, sleepiness, headaches, dizziness, confusion, blurred vision.
- Most drugs can alter a person's mood and feelings → make people angry, violent, ect.

TOLERANCE: a state in which a drug user needs more of a drug to produce the same effect on the body.

- Can cause people to take a large amount of a drug called an overdose.

ADDICTION: the body becomes physically dependent on the drug.

- Body can react violently if an addict misses a dose of the drug.
- WITHDRAWAL: an adjustment period that occurs when a person stops taking a drug on which the body is dependent.

### What are Some Commonly Abused Drugs?

- Some commonly abused drugs are marijuana, depressants, stimulants, inhalants, hallucinogens, and steroids.

DEPRESSANTS: drugs that slow down the activity of the CNS

Example: \_\_\_\_\_

STIMULANTS: drugs that speed up body processes.

Example: \_\_\_\_\_

ANABOLIC STEROIDS: synthetic chemicals that are similar to hormones naturally produced in the body.

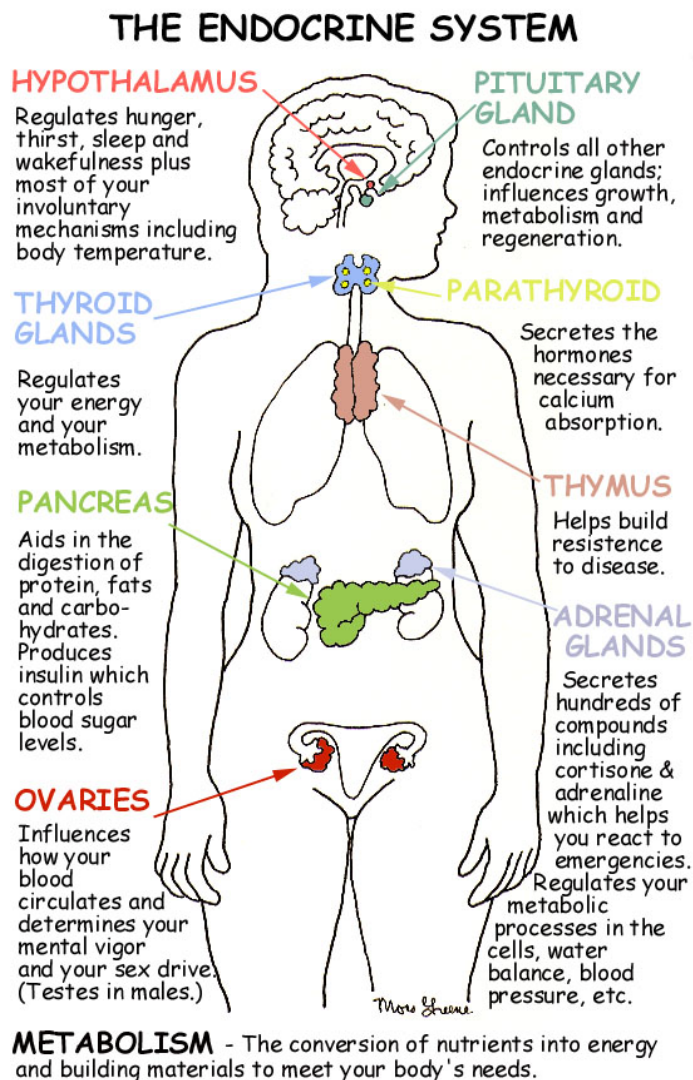
## Lesson 1: The Endocrine System

### How Does the Endocrine System Function?

- The endocrine system regulates short-term and long-term activities by sending chemicals throughout the body. Long-term changes include growth and development.
- GLAND: an endocrine organ that produces or releases a chemical.
- DUCTS: tiny tubes that release chemicals produced by some glands.
  - Deliver chemicals to specific places in the body or skin's surface.
- Some glands release chemicals into blood.

HORMONES: the chemical produced by an endocrine gland that can turn on, turn off, speed up, or slow down the activities of organs and tissues.

- "Chemical Messengers"
- Travel through the blood.
- Cause a slower, longer-lasting response than nerve impulses.
- TARGET CELLS: cells that are specialized in a way that enables them to recognize a hormone's chemical structure.



### **Regulators of the Endocrine System**

- Nervous system and endocrine system work together.
- HYPOTHALAMUS: part of your brain that links the two systems by sending out nerve messages that control sleep, hunger and other basic body processes.
- PITUITARY GLAND: works with the hypothalamus to control many body activities through the release of hormones, like growth.

### **What Controls Hormone Levels?**

- Endocrine system works like a thermostat.
- NEGATIVE FEEDBACK: a process in which a system is turned off by the condition it produces.
- When the amount of hormone in the blood reaches a certain level, the endocrine system sends signals that stop the release of that hormone.