The Human Body

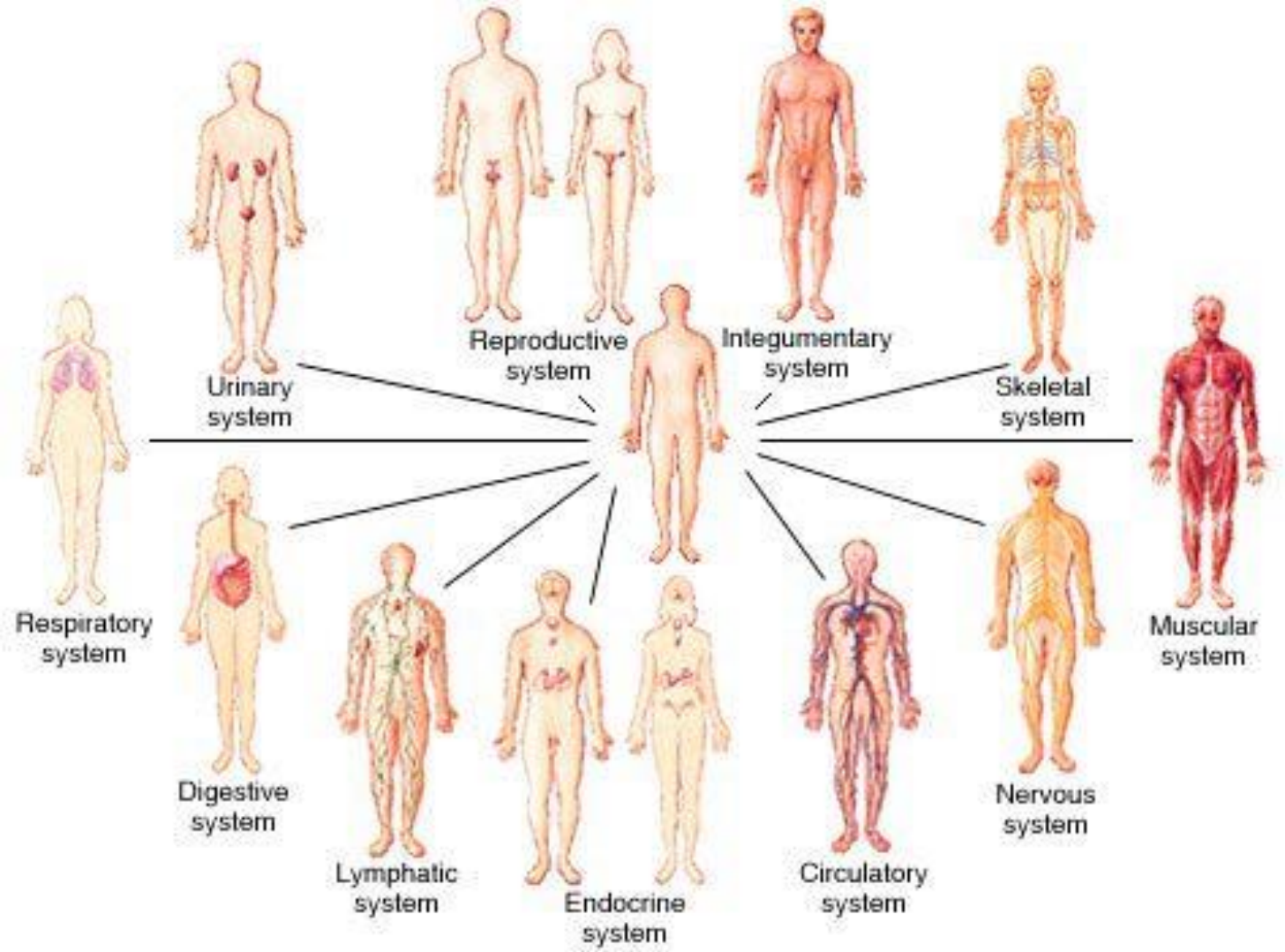
Chapters 35-40

- Specialized cells make up tissues
- A collection of specialized tissues make up organs that perform a function
- Organs are part of larger systems that perform all functions necessary for multicellular organisms to live, grow, reproduce, use energy, respond to stimuli and maintain homeostasis

Main Ideas

Main Ideas

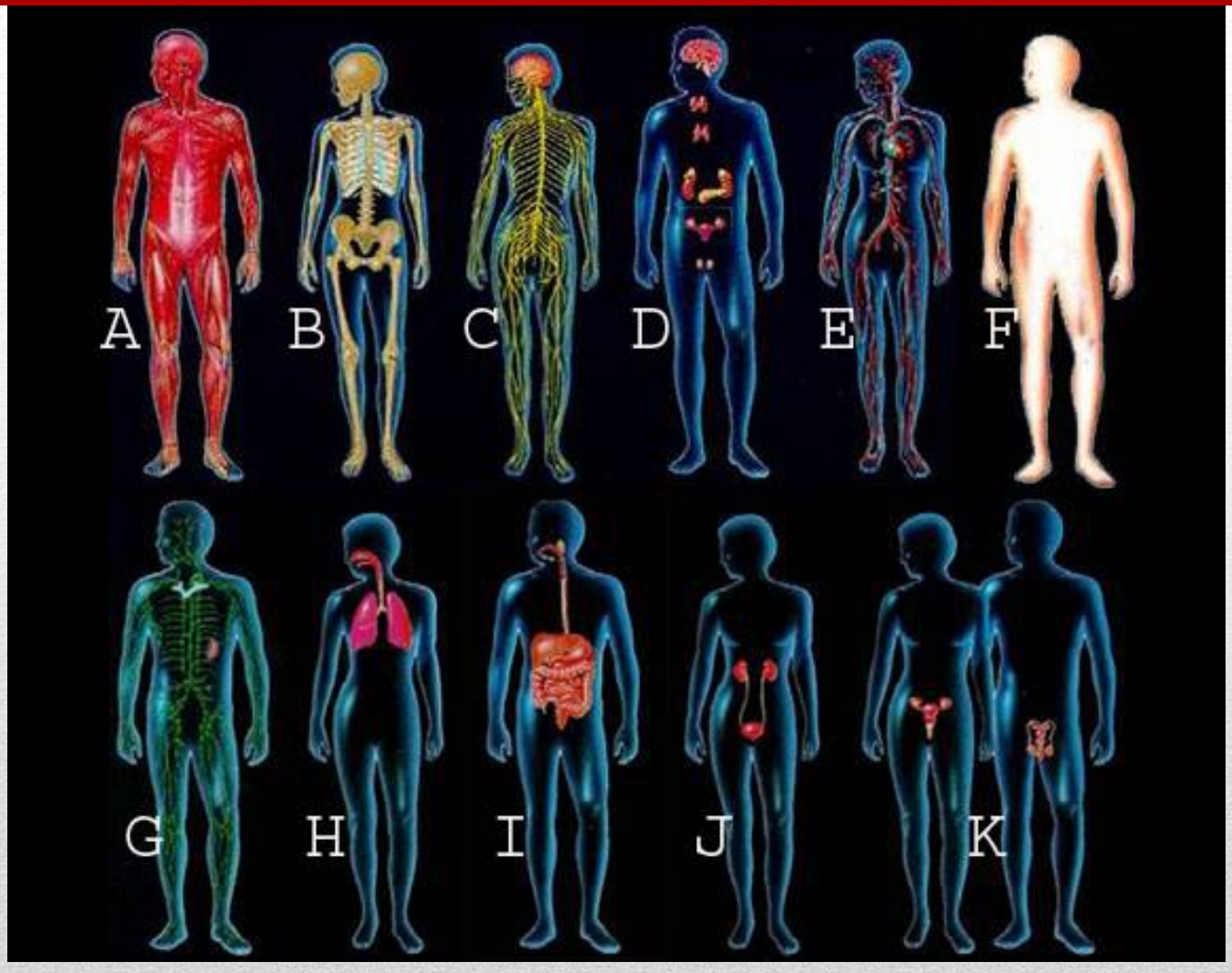
- Anatomy is the study of the structure of the organs and organ systems
- Physiology is the study of the function of the organs and organ systems



Human Organ Systems

- Cells, tissues, organs, organ system, organism

35-1 Levels of Organization



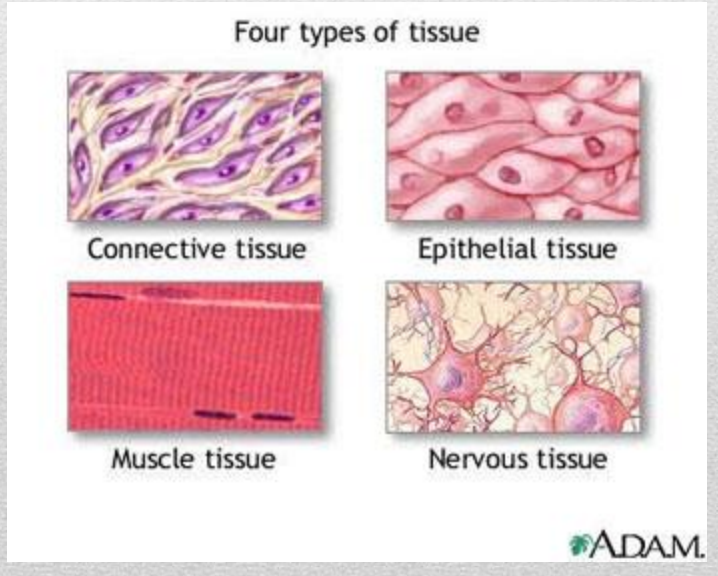
11 Organ Systems

Functions of Organ Systems

Organ System	Functions	Organs
Integumentary system	Barrier to invading organisms and chemicals; temperature control	Skin, hair, subcutaneous tissue
Skeletal system	Supports and moves body; protects internal organs; mineral storage; blood formation	Bones, cartilage, ligaments; bone marrow
Muscular system	Locomotion; heat production	Muscles, tendons
Nervous system	Coordinates activities of other organ systems; responds to sensations	Brain, spinal cord, nerves, eyes, ears
Endocrine system	Regulates body functions by chemicals *(hormones)*	Pituitary gland, parathyroid gland, thyroid gland, adrenal gland, thymus, pancreas, gonads
Cardiovascular system	Transports oxygen and nutrients to tissues; removes waste products	Heart, blood, blood vessels
Lymphatic system	Returns tissue fluid to blood; defense against foreign organisms	Spleen, lymph nodes, thymus, lymphatic vessels
Respiratory system	Oxygen/carbon dioxide exchange;	Lungs, trachea, larynx, nasal cavities, pharynx
Digestive system	Processes foods; absorption of nutrients into body	Stomach, intestinal tract, liver, pancreas, esophagus, salivary glands
Urinary system	Elimination of wastes; regulates pH and volume of blood	Kidneys, urinary bladder, urethra
Reproductive system	Produces germ cells *(eggs and sperm)*; environment for growth of fetus *(women)*	Ovaries, uterus; mammary glands; Testes, prostate gland; External genitalia

Types of Tissues

- Muscle-most abundant, controls movement
- Epithelial-covers the surface of the body
- Connective-holds organs together; tendons and ligaments
- Nervous-receives messages, analyzes data, directs responses

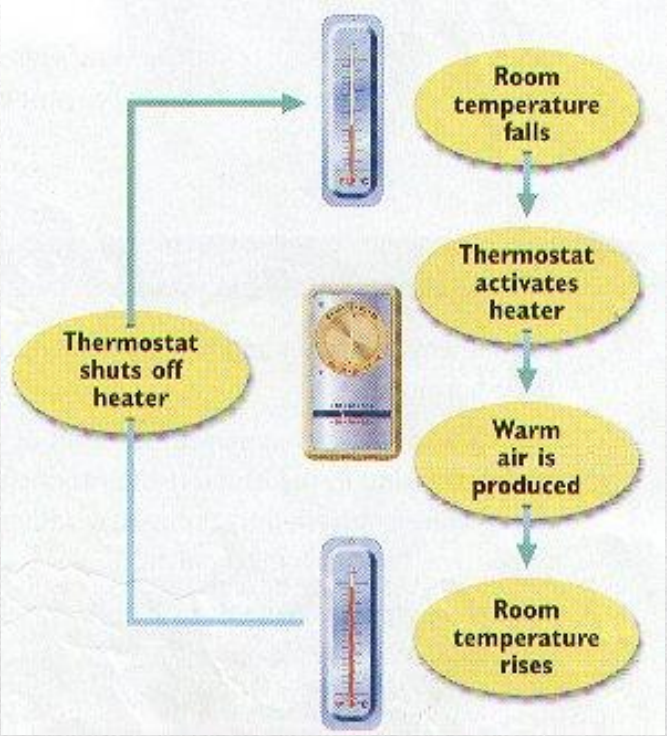


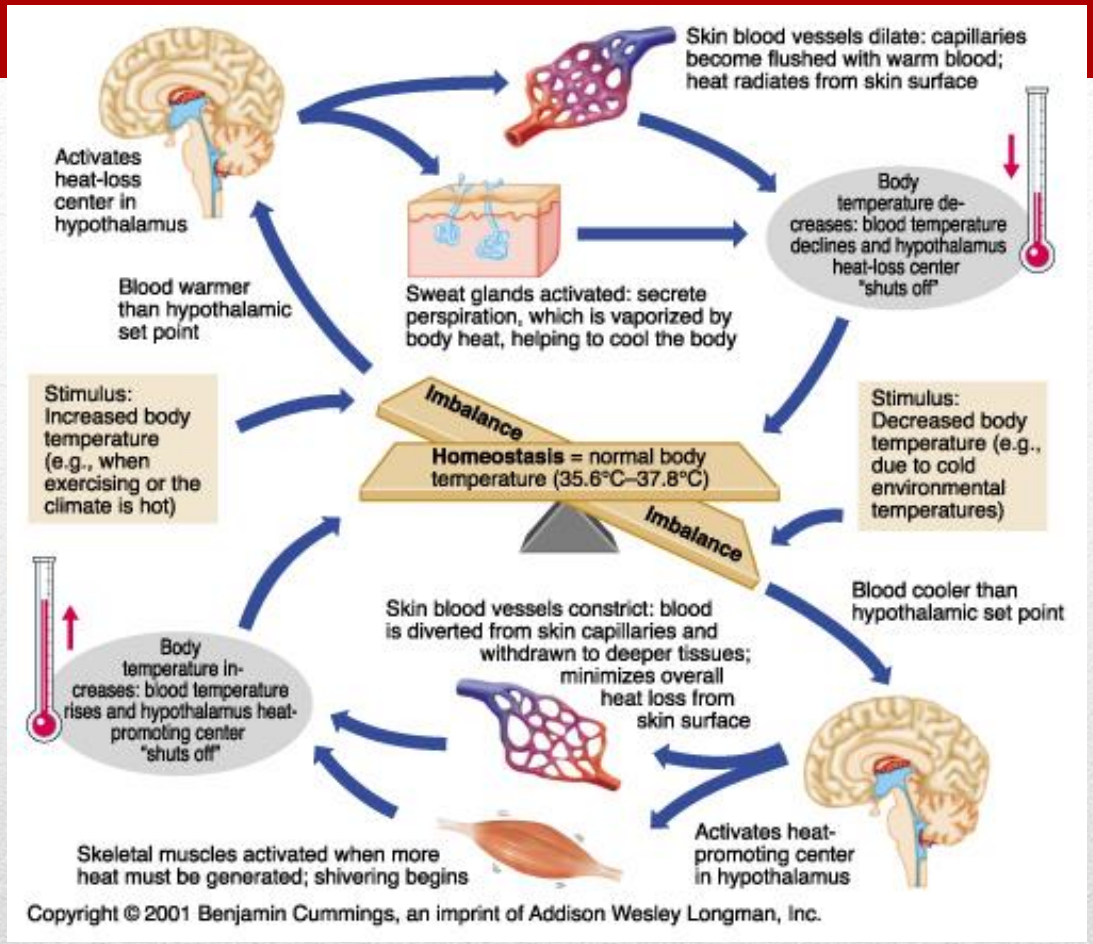
Maintaining Homeostasis

- Human bodies must:
- Maintain a constant temperature
- Use energy in cellular respiration
- Be kept bathed in fluid
- Be cleansed of waste products
- =Homeostasis

Maintaining Homeostasis

- Works by feedback
- Positive-signal turns something on
- Negative-signal turns something off
- Thermostat example





Skin, nervous system and circulatory system maintains human body temperature

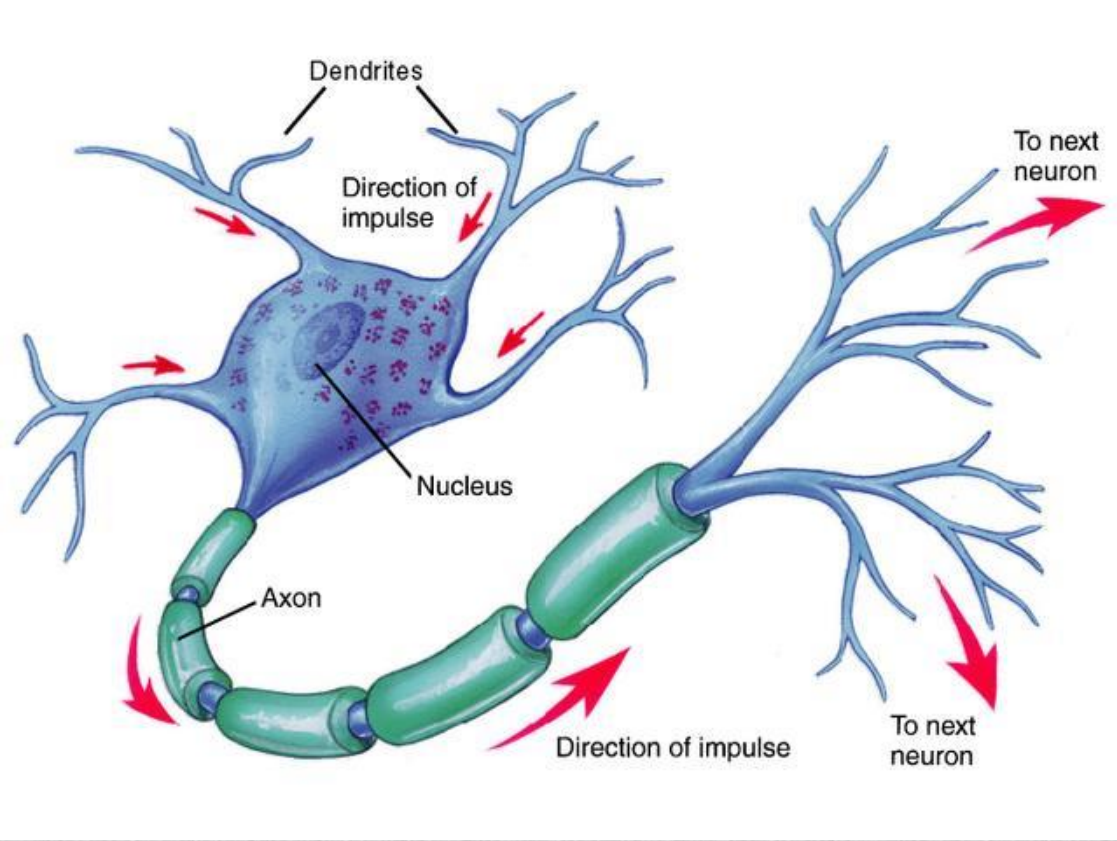
Maintaining Homeostasis

- Function is to control and coordinate functions throughout the body and respond to internal and external stimuli
- Made up of neurons

35-2 The Nervous System

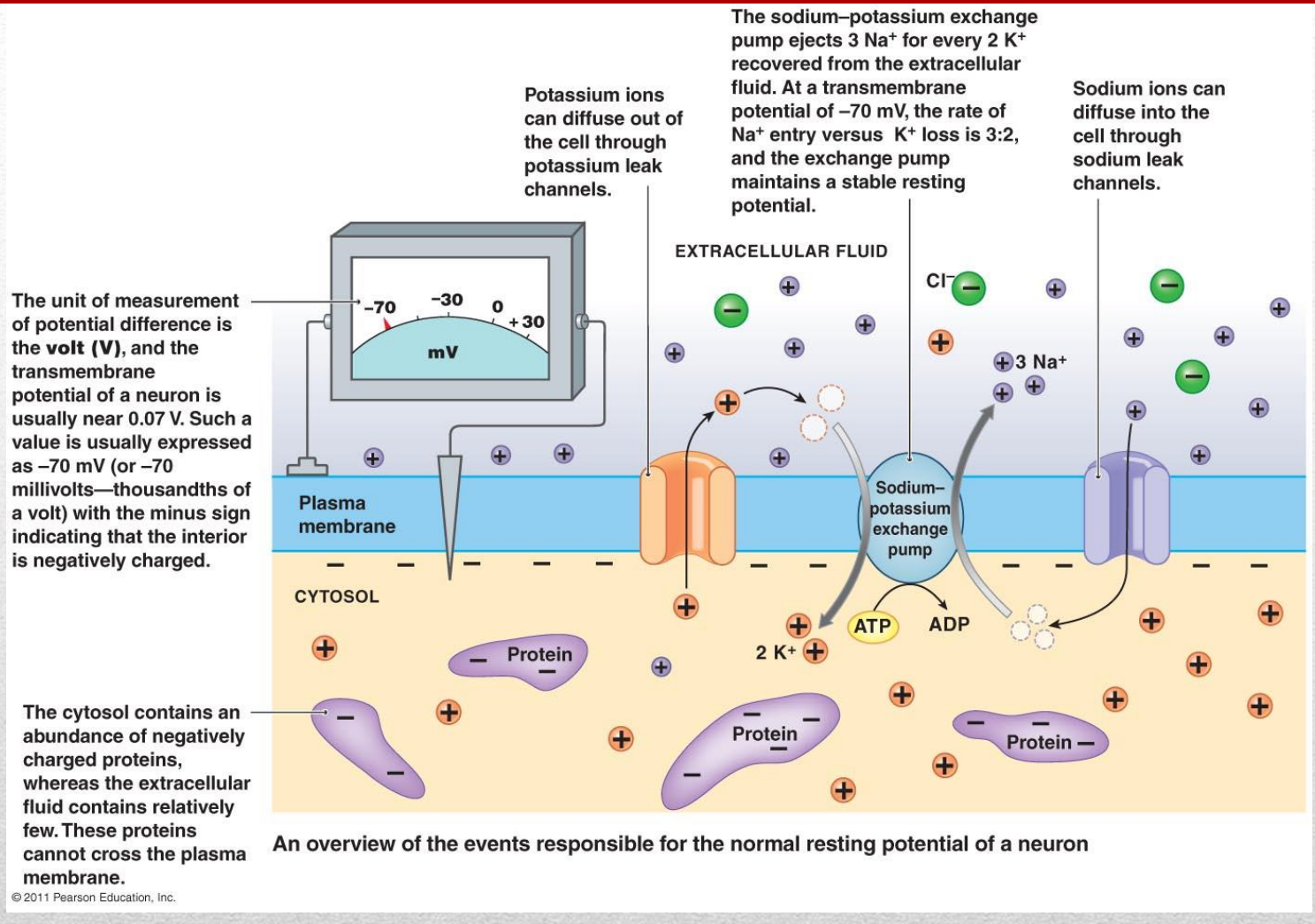
The Nervous System

- Structure of neurons
- Cell body
- Axons
- Dendrites
- Myelin sheath



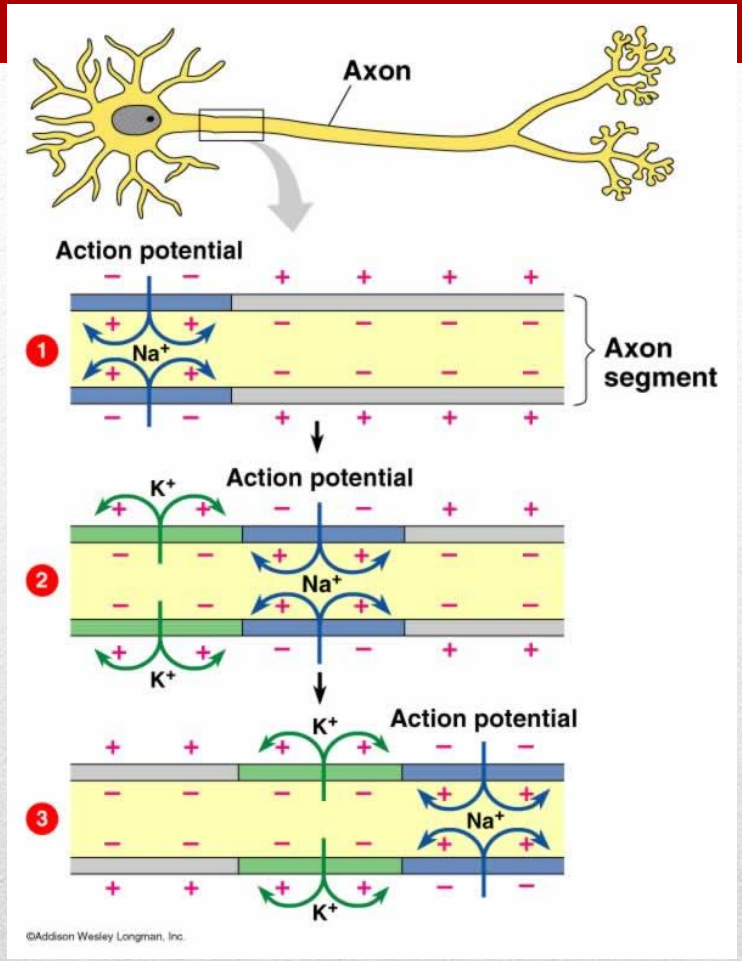
The Nerve Impulse

- Resting Potential-voltage potential across the cell membrane when the neuron is resting
- Due to electrochemical energy
- The Moving Impulse-the electrical potential moves through the cell like a ripple in water
- Action potential-when the resting potential Is reversed (negative regions become positive, positive region becomes negative)
- Threshold-minimum level of stimulus to cause an action potential



An overview of the events responsible for the normal resting potential of a neuron

The Nerve Impulse-Resting Potential



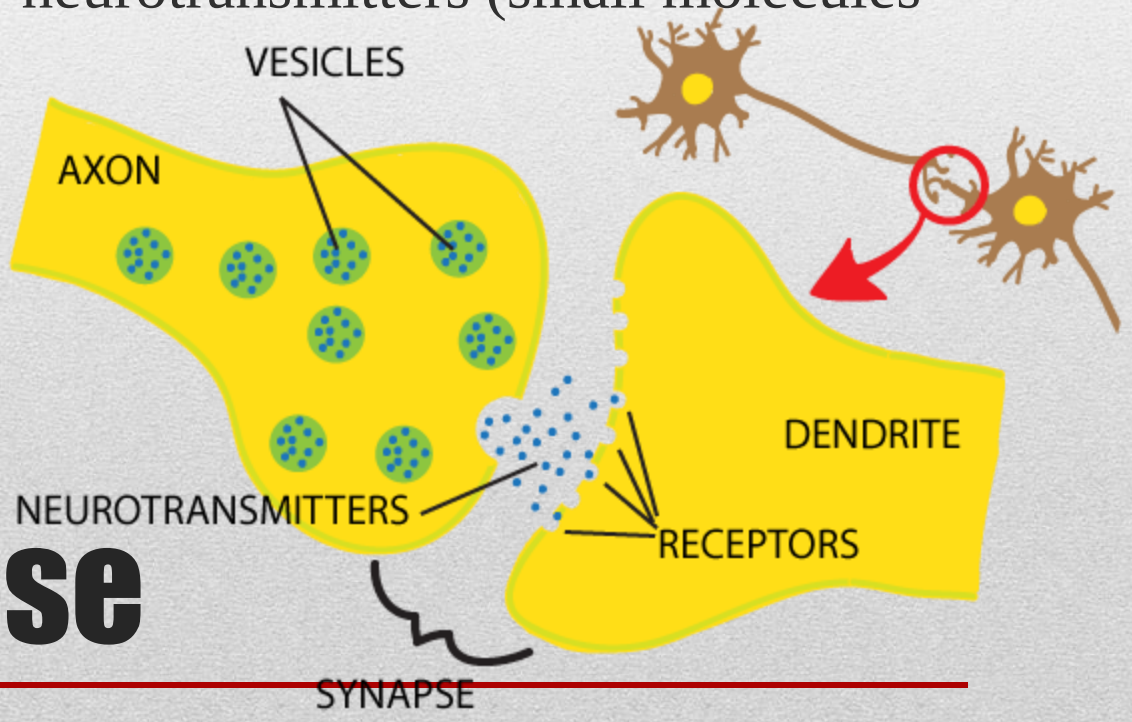
The Nerve Impulse-Action Potential

- https://www.youtube.com/watch?v=jcZLtH-Uv8M

The Nerve Impulse

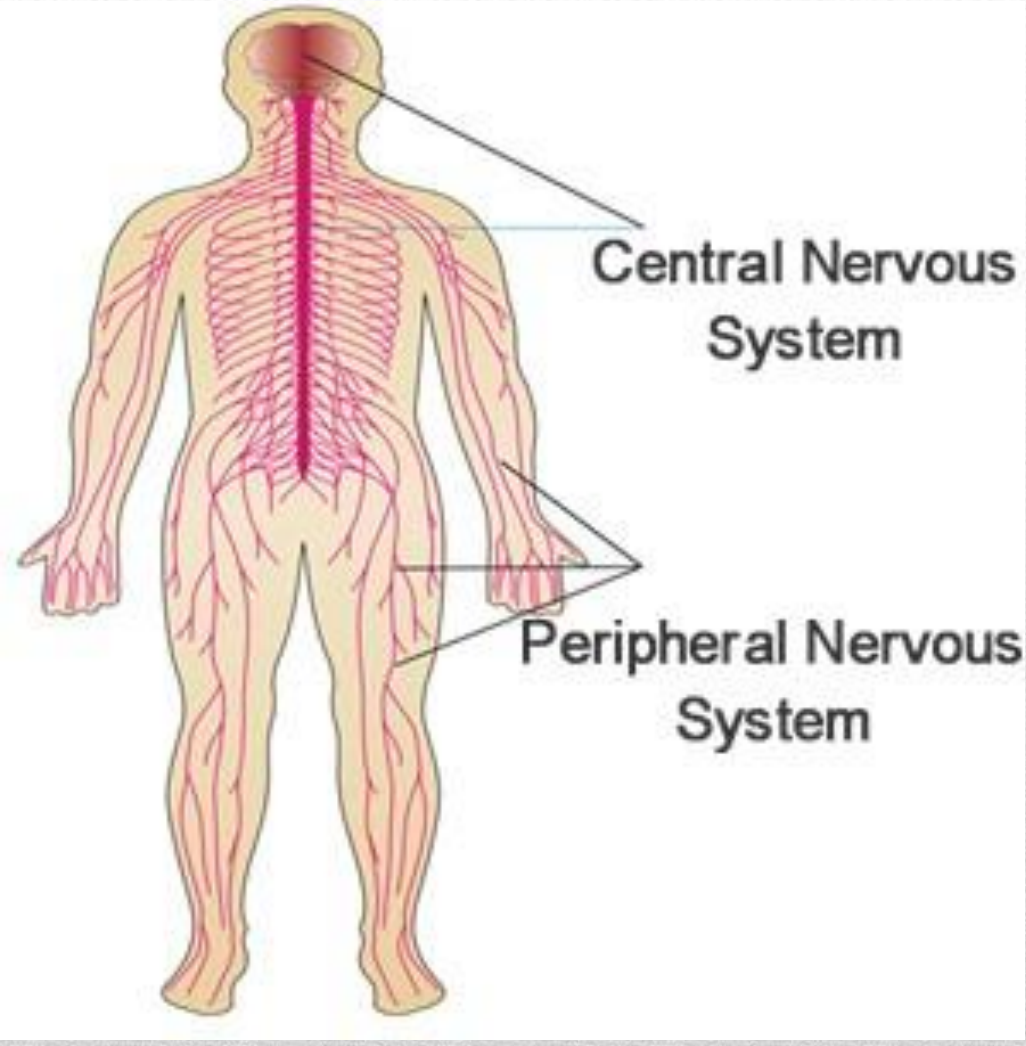
The Synapse

- Synapse-the location where a neuron can transmit the signal to another cell
- Signal transmitted by neurotransmitters (small molecules and peptides)



- Central Nervous System-relays messages, processes information and analyzes information
- Brain and spinal cord
- Meninges are connective tissue that covers brain and spinal cord
- Cerebrospinal fluid-bathes brain and spinal cord and acts as a shock absorber

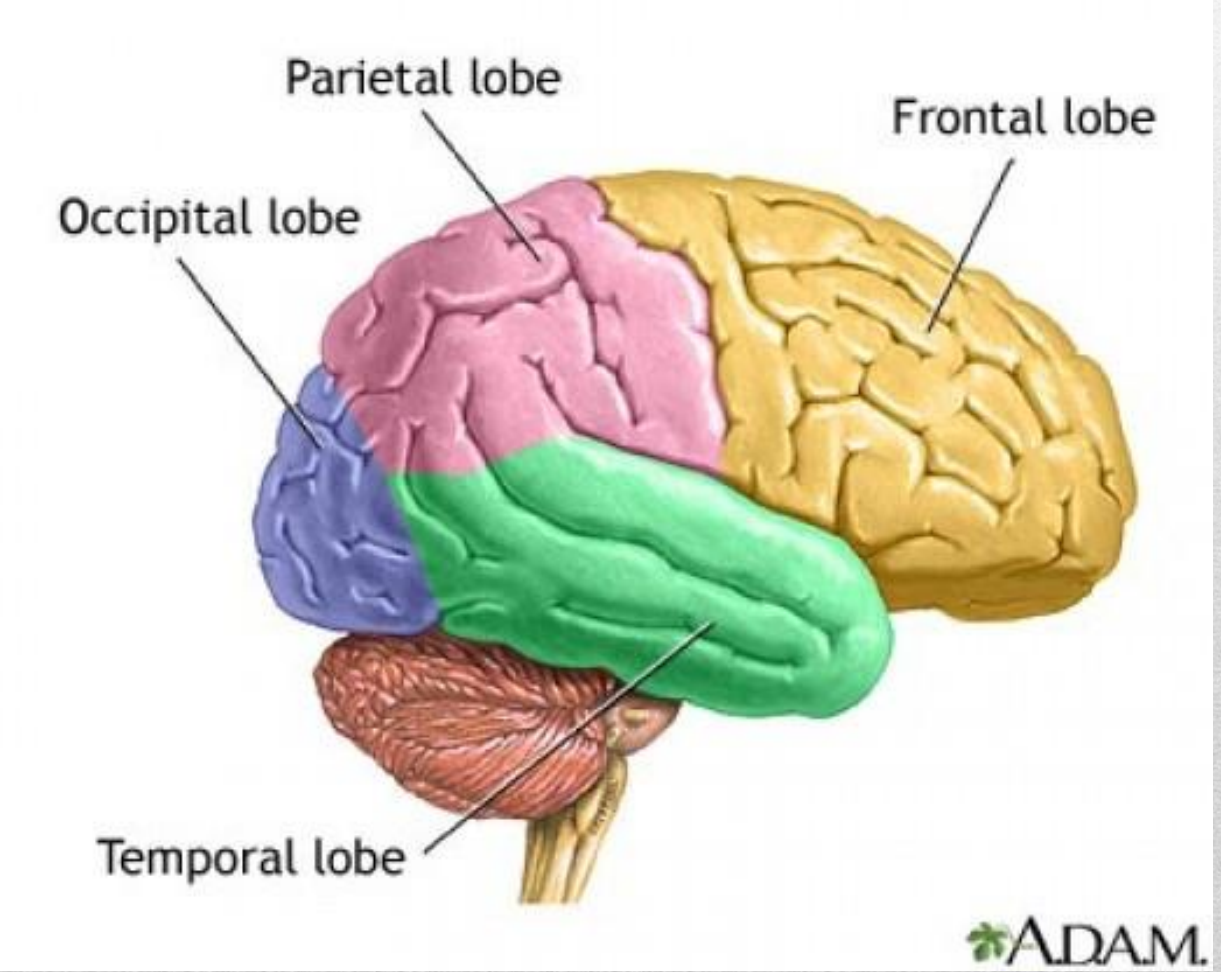
35-3 Divisions of the Nervous System



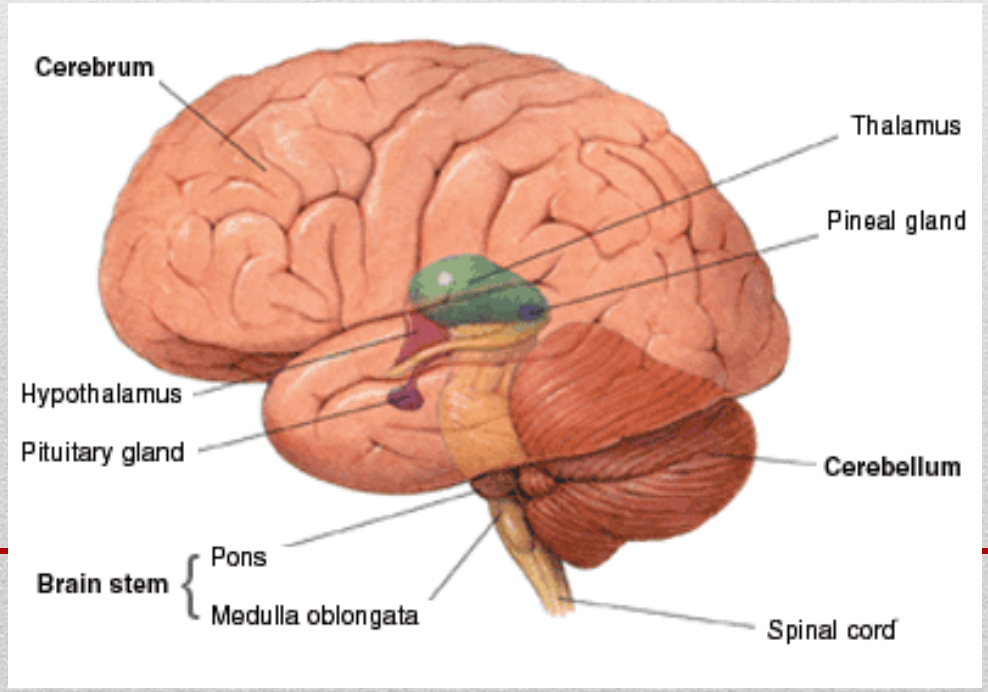
Central Nervous System

Brain

- Frontal Lobe-conscious thought
- Parietal Lobe-Integrates sensory information
- Occipital Lobe-Vision
- Temporal-smell, sound, faces

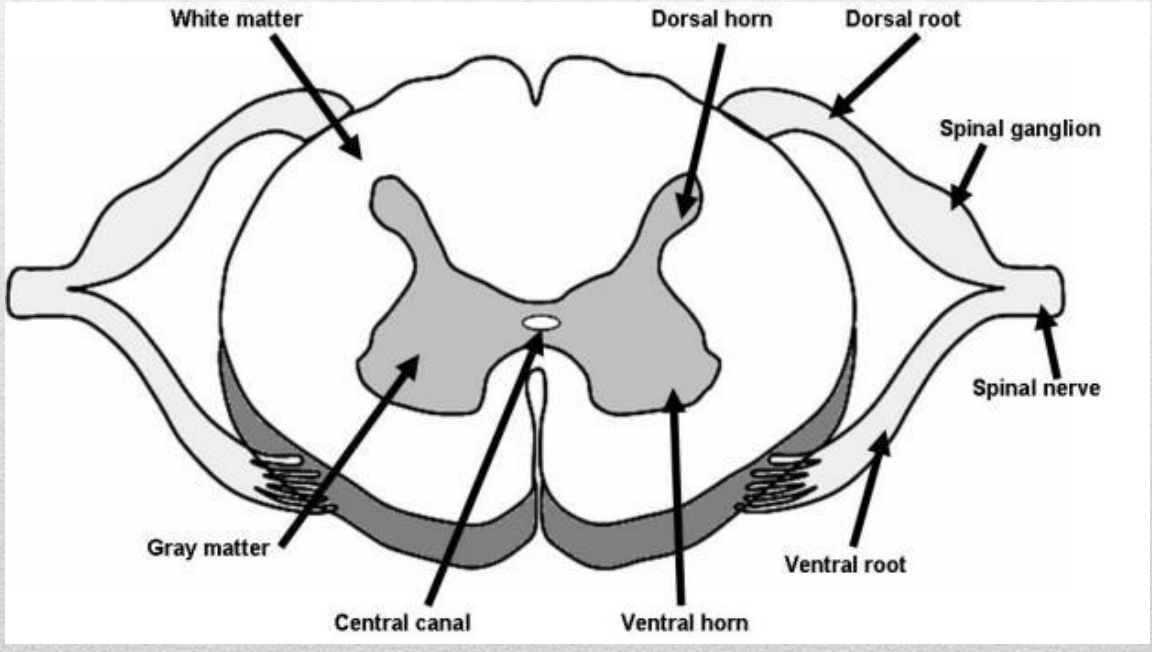


- Cerebrum-Voluntary conscious activities of the body
- Cerebellum-coordinates balance and actions of the muscles
- Brain Stem-Pons and Medulla Oblongata-Regulates flow of information between brain and rest of body
- Thalamus-receives info from sense organs
- Hypothalamus-control center for recognition and analysis of hunger, thirst, fatigue, anger and body temperature



Spinal Cord

- Carries signals from the brain to rest of the body
- Reflexes are processed in spinal cord, do not go to brain

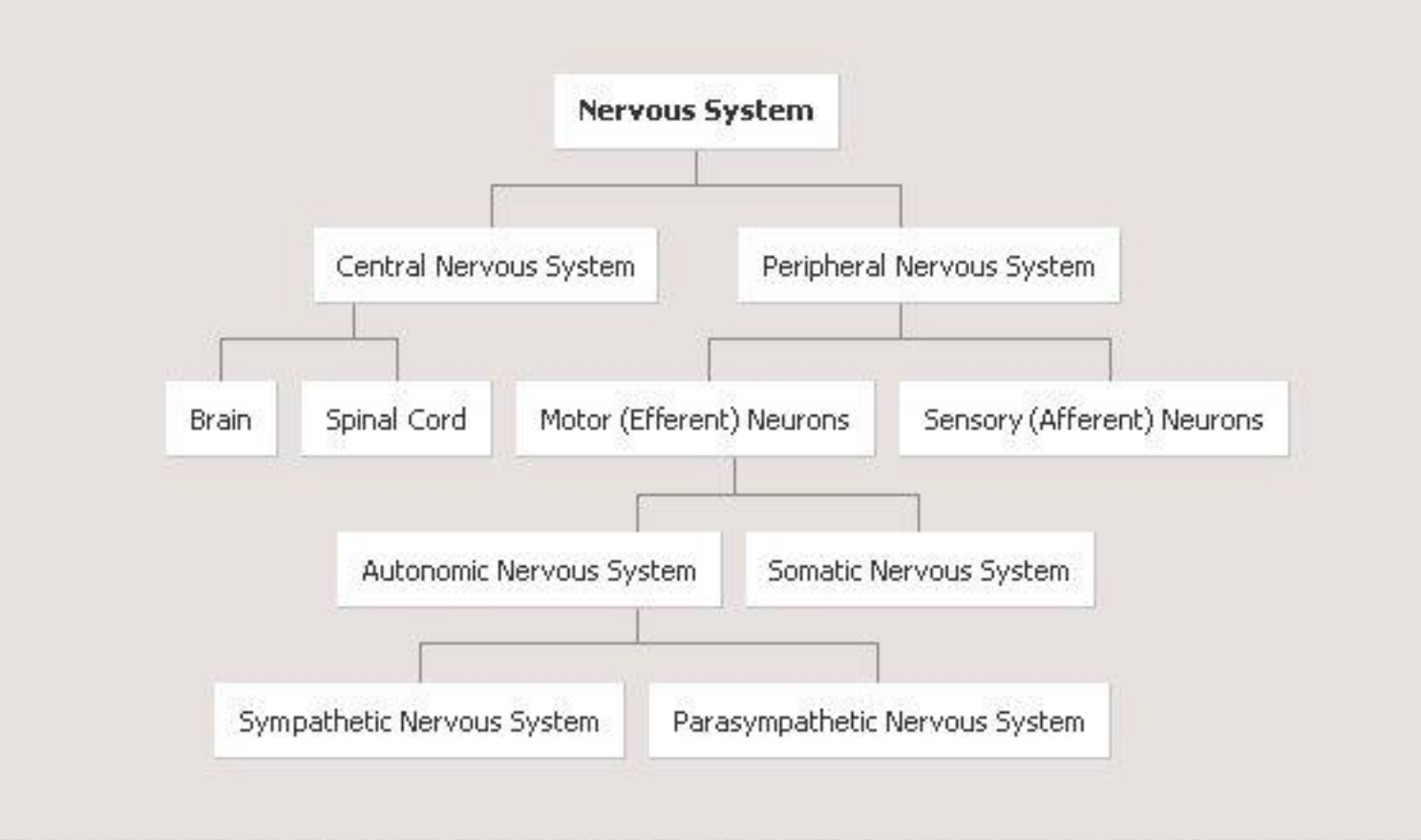


Peripheral Nervous System

- Includes all nerves not in central nervous system
- Sensory division-transmits info from sense organs to central nervous system (CNS)
- Motor Division-transmits info from CNS to muscles and glands

Motor Division of Peripheral Nervous System

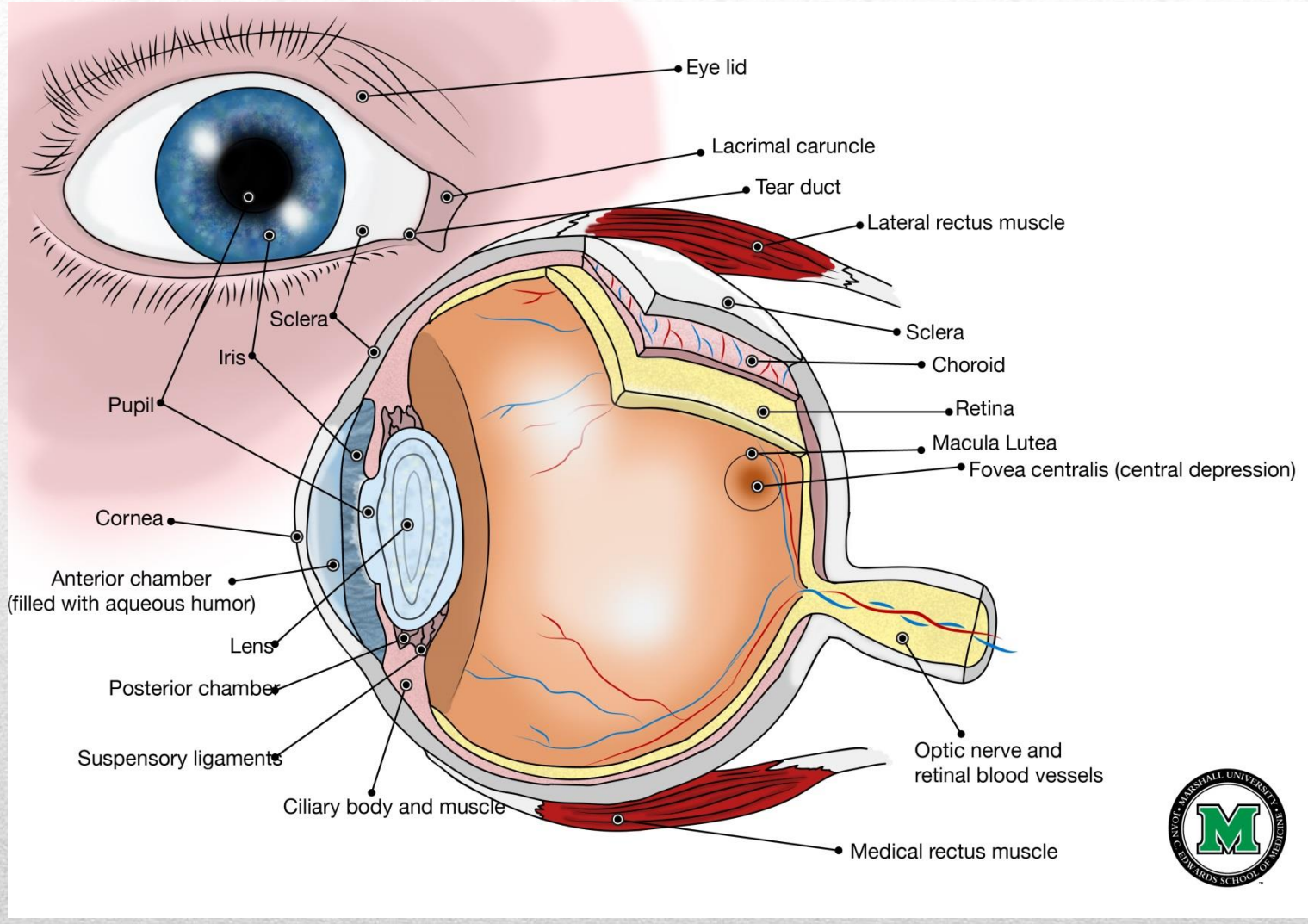
- Somatic Nervous System-regulates activities that are under conscious control
- Autonomic Nervous System-regulates involuntary activities like heartbeat, contraction of smooth muscles in digestive tract; further divided into sympathetic and parasympathetic systems, which have opposite effects (one increases heart rate, one decreases)



Organization of Nervous System

35-4 The Senses

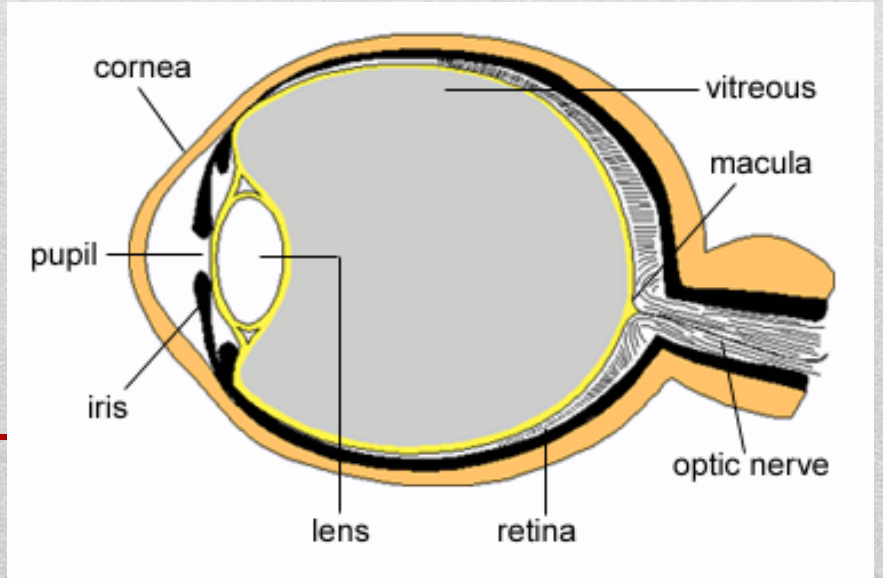
- Stimuli is detected by sensory receptors
- 5 types of sensory receptors
  - Pain-located throughout the body
  - Thermoreceptors-skin, body core, hypothalamus
  - Mechanoreceptors-skin, skeletal muscles and inner ears
  - Chemoreceptors-nose and taste buds
  - Photoreceptors-eyes

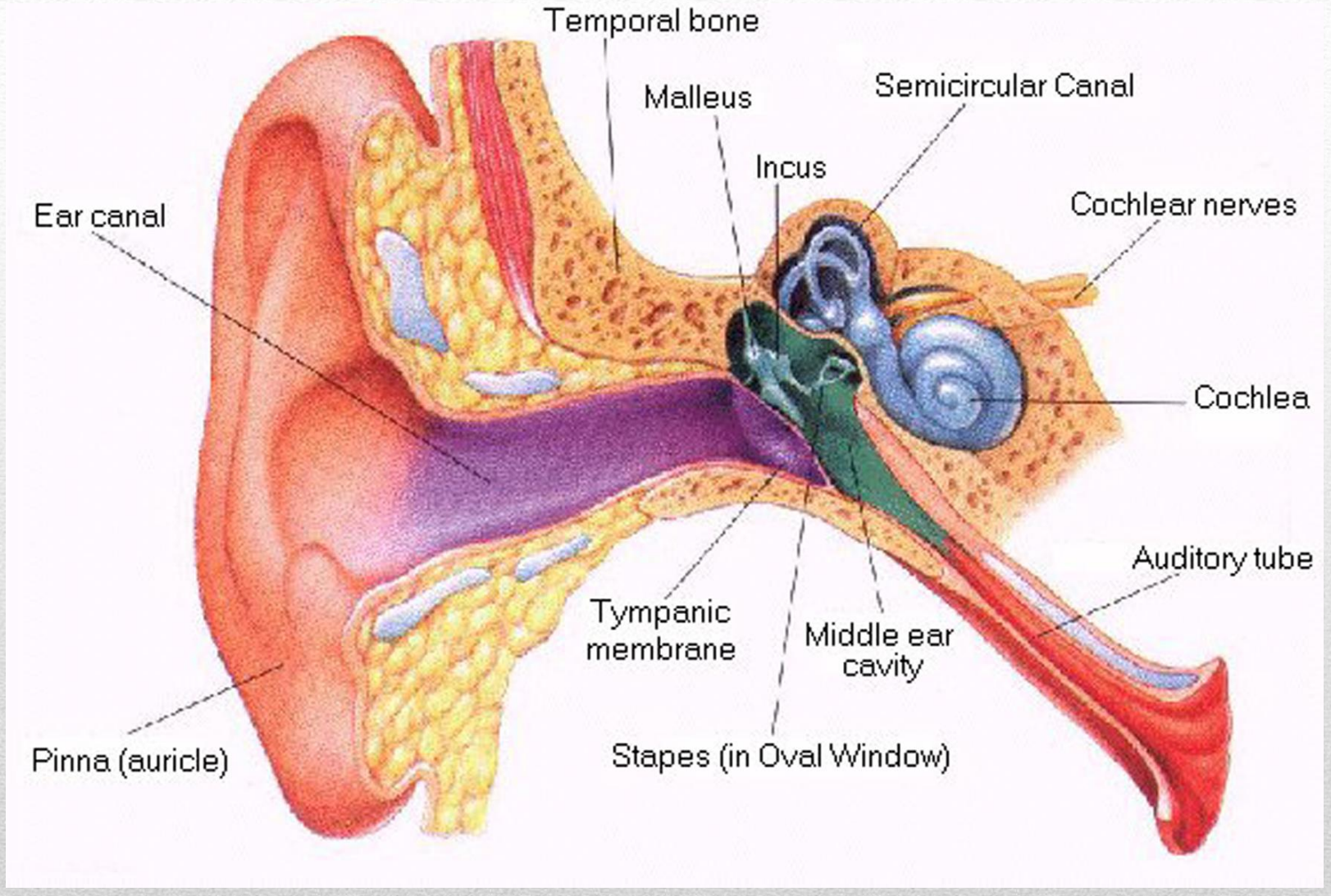

Eye lid
Lacrimal caruncle
Tear duct
Lateral rectus muscle
Sclera
Iris
Pupil
Sclera
Choroid
Retina
Macula Lutea
Fovea centralis (central depression)
Cornea
Anterior chamber
(filled with aqueous humor)
Lens
Posterior chamber
Suspensory ligaments
Ciliary body and muscle
Optic nerve and
retinal blood vessels
Medical rectus muscle

Vision

- Light enters through cornea, which focuses light
- Light passes through anterior chamber and aqueous humor (liquid)
- Next passes through the pupil in the Iris
- Lens, behind the pupil focuses image and focuses light on the retina-rods respond to light, cones see color
- Light focuses on fovea
- Signal sent through optic nerve to the brain

Path of light in eye

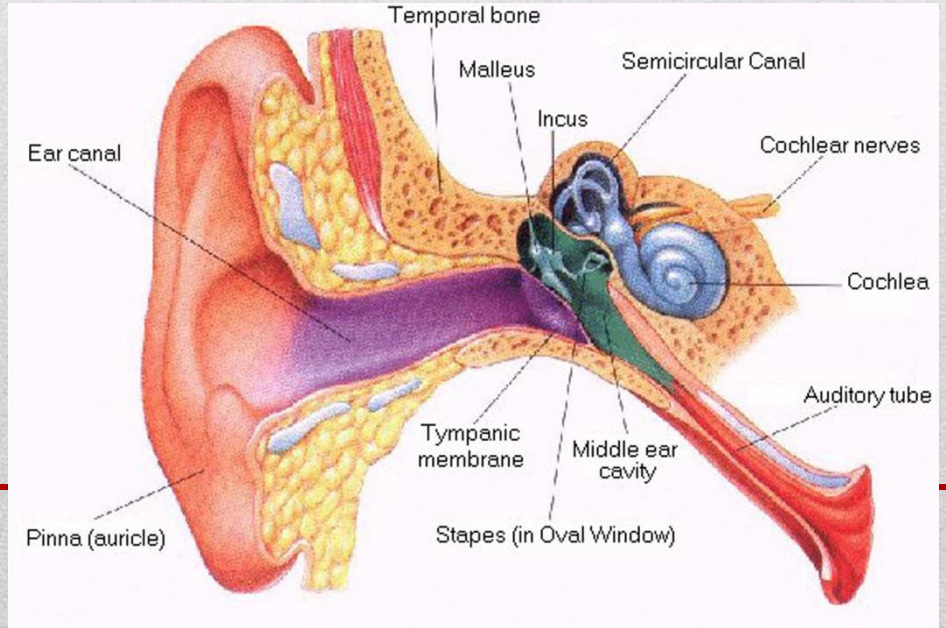




Hearing and Balance

Hearing

- Sound is vibrations in the ear
- Vibrations move through auditory canal and cause the tympanum (eardrum) to vibrate
- Hammer anvil and stirrup (bones) pick up vibrations
- Vibrations go from stirrup to oval window
- Causes pressure waves in fluid in cochlea
- Tiny hairs are moved by pressure waves in cochlea which causes nerve impulses that go to brain

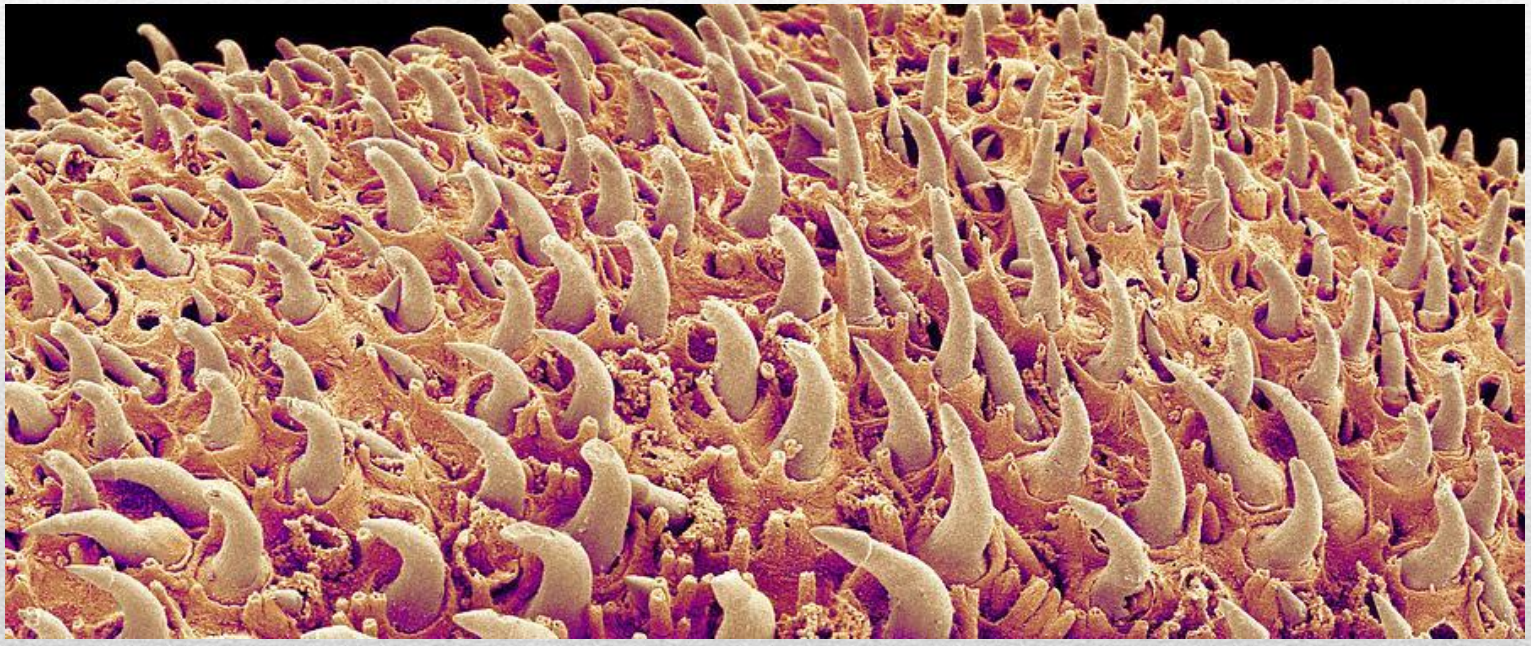


Hairs In Cochlea

Balance

- Ears help CNS maintain balance
- Above cochlea, semicircular canals monitor position of head and body in relation to gravity
- Lined with hairs. When head changes position, fluid bends the hairs which sends signals to brain

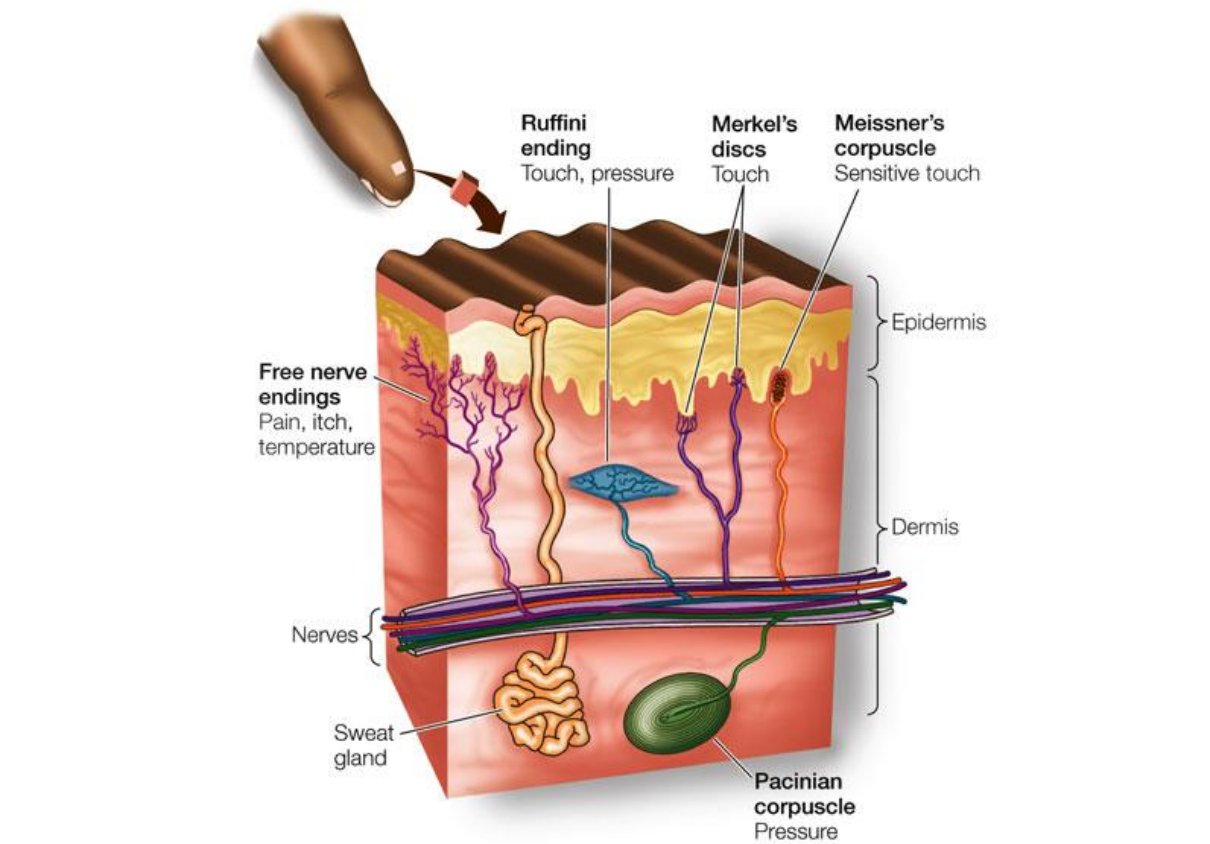
- Chemoreceptors
- Smell and taste are connected
- Olfactory receptors and taste buds



Smell and Taste

Touch

- Mechanoreceptors found in skin
- Most concentrated in fingers, toes and face



LIFE 8e, Figure 45.6

- Stimulants-increase heart rate, blood pressure, breathing rate, release of neurotransmitters in synapses
- Can deplete neurotransmitters and results in fatigue, depression, circulatory problems, hallucinations
- Amphetamines, nicotine, caffeine

35-5 Drugs and the Nervous System

- Depressants-decrease heart rate, blood pressure, relax muscles and relieve tension
- Prevent nerve cells from starting an action potential
- Can be addicting
- Depressants and alcohol together can be fatal
- Xanax, valium

35-5 Drugs and the Nervous System

- Cocaine and Crack-causes sudden release of neurotransmitter dopamine in the brain
- Stimulates “pleasure centers” in the brain
- Addictive
- Stimulant

35-5 Drugs and the Nervous System

- Opiates-mimic natural chemicals in brain, endorphins
- Help to overcome sensation of pain
- Addictive
- Morphine, oxycodone, codiene

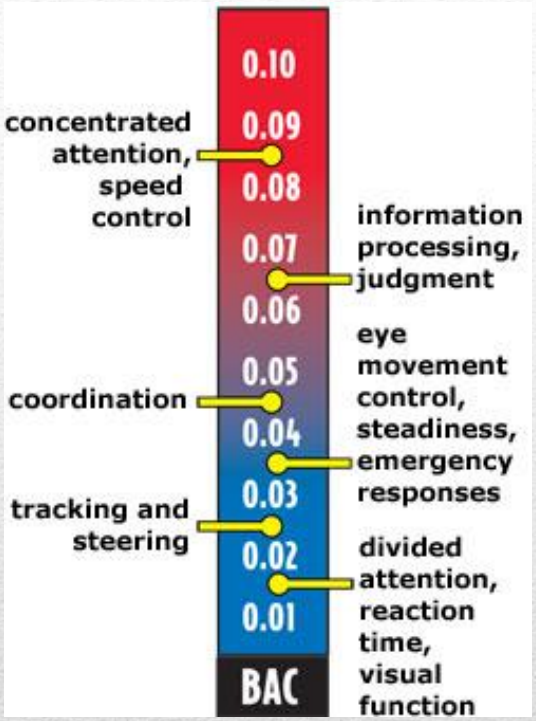
35-5 Drugs and the Nervous System

- Marijuana-Most abused illegal drug
- Active ingredient is THC
- Temporary feeling of euphoria
- Smoking is dangerous to lungs
- Loss of memory, inability to concentrate

35-5 Drugs and the Nervous System

- Alcohol-most dangerous and abused legal drug
- Depressant
- Impairs judgment and motor skills, heart and breathing rate
- Especially dangerous to developing fetuses and children because affects nervous system development
- Damages liver
- Leads to alcoholism

35-5 Drugs and the Nervous System



Weight	Drinks (Two-Hour Period)											
100	1	2	3	4	5	6	7	8	9	10	11	12
120	1	2	3	4	5	6	7	8	9	10	11	12
140	1	2	3	4	5	6	7	8	9	10	11	12
160	1	2	3	4	5	6	7	8	9	10	11	12
180	1	2	3	4	5	6	7	8	9	10	11	12
200	1	2	3	4	5	6	7	8	9	10	11	12
220	1	2	3	4	5	6	7	8	9	10	11	12
240	1	2	3	4	5	6	7	8	9	10	11	12
	Caution			Driving Impaired			Legally Drunk					

Blood Alcohol Concentration (BAC)