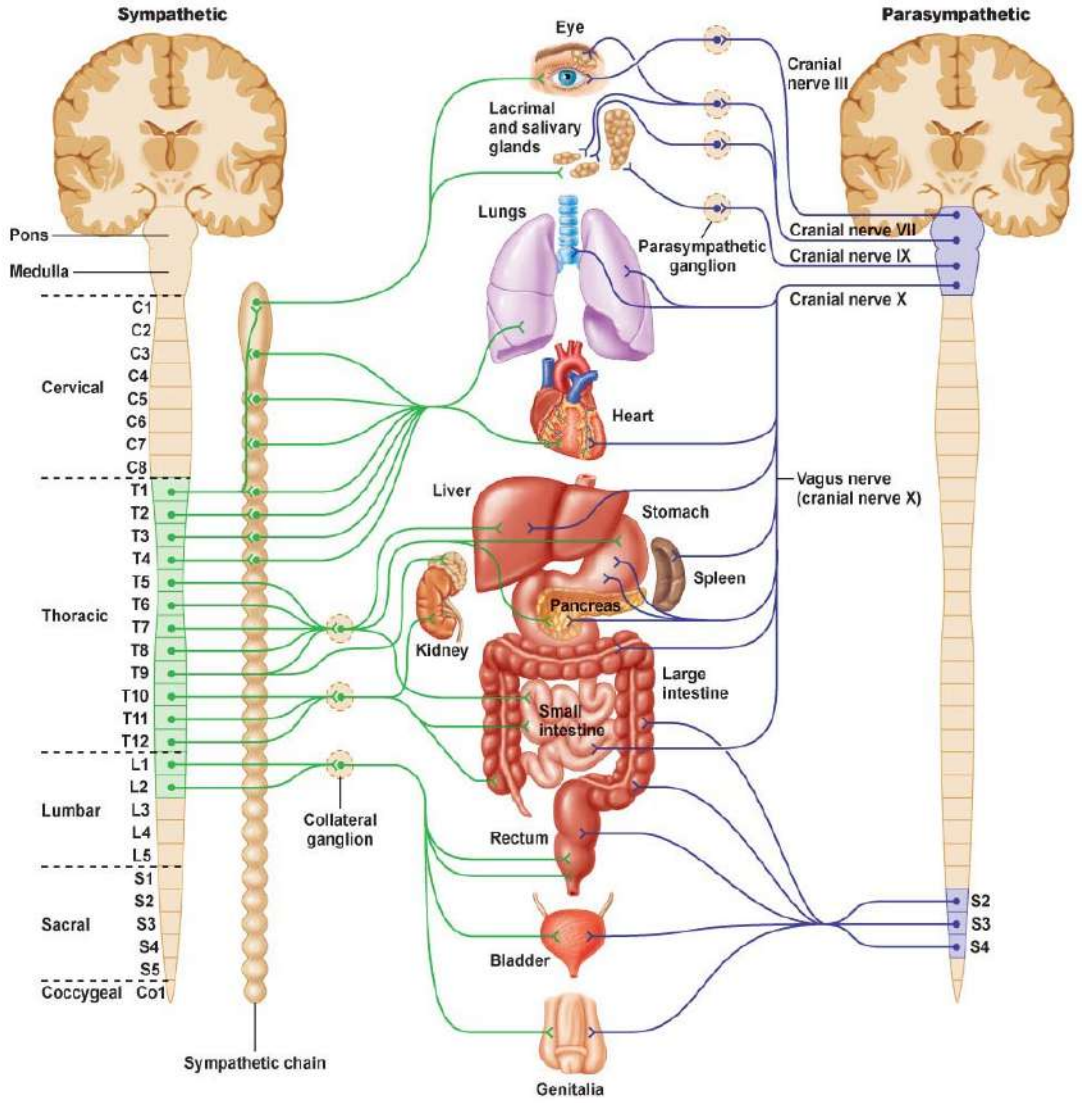
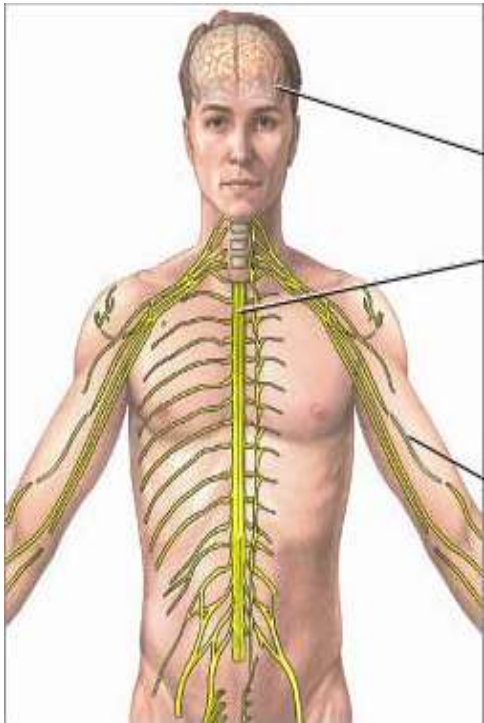
The Nervous System:



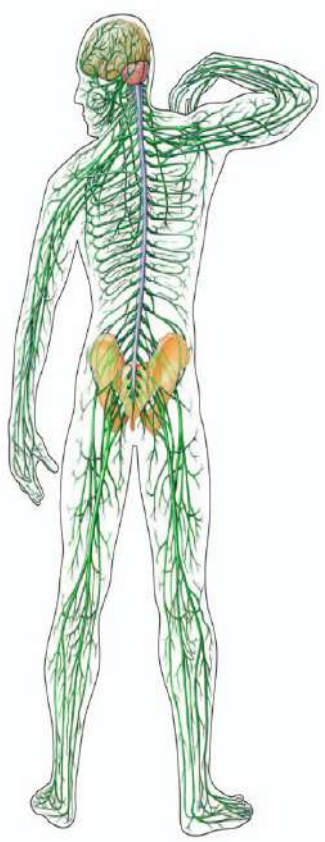
Overview

- The Nervous System controls and coordinates all the functions of the body.
- The Nervous System consists of two main sub-divisions:
  - Central Nervous System (CNS)
  - Peripheral Nervous System (PNS)
- The Peripheral Nervous System is divided into two sub-divisions:
  - Somatic
  - Autonomic

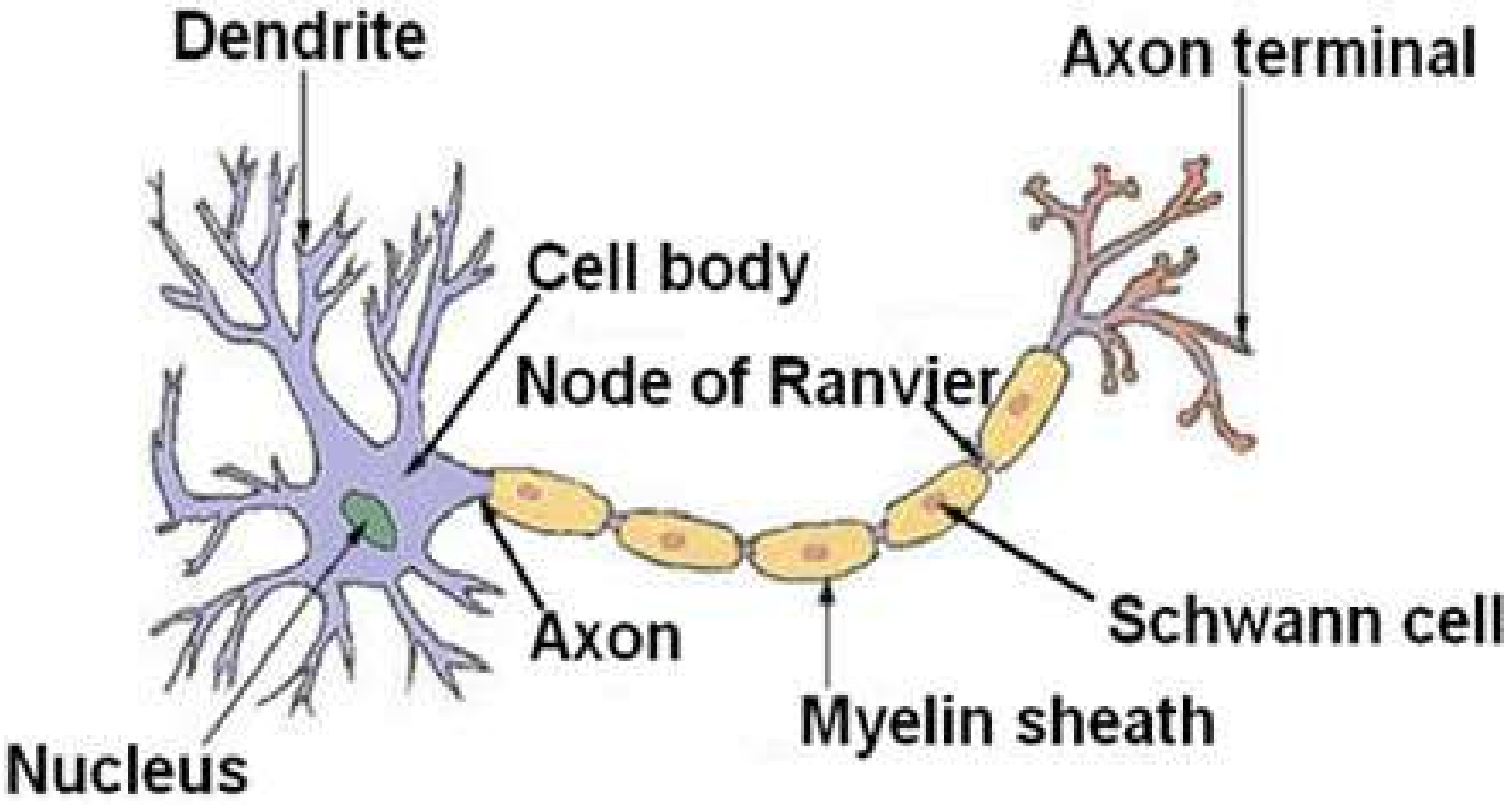


Structure and Function of the Neuron

- **Neuron** is the scientific name for a Nerve Cell.
- Neurons consist of 3 basic structures:
  - **Cyton**, or cell body.
  - **Dendrites-** receive messages, impulses, and send them to the cell body.
  - **Axons-** send messages away from the cell body.
- Nerve impulses travel from one neuron to another across **synapses**, or spaces in-between the cells.
- The "jumping across" the synapse is facilitated by chemicals called **Neurotransmitters**.

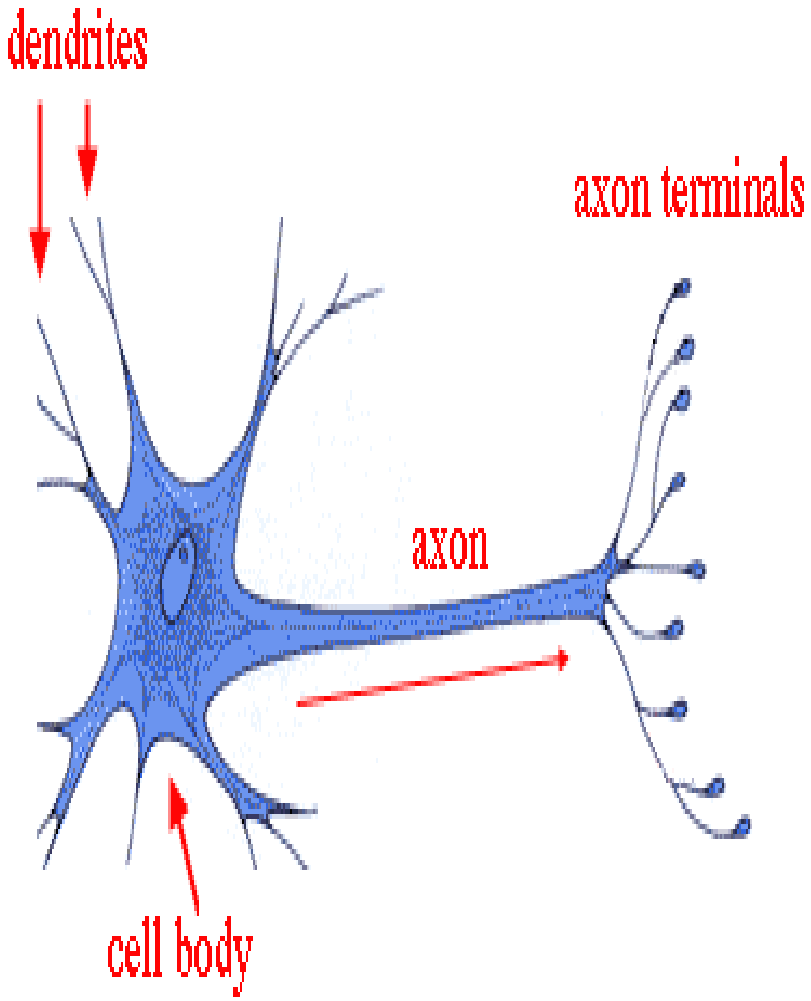


Structure of a Typical Neuron



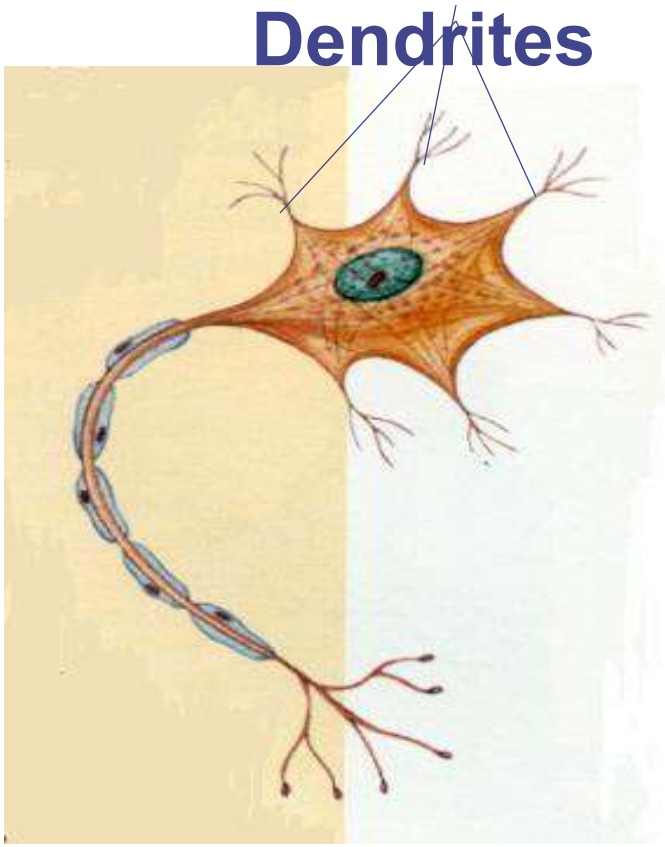
Nerve Cells (neurons)

- Basic unit of the nervous system
- Pass impulses along



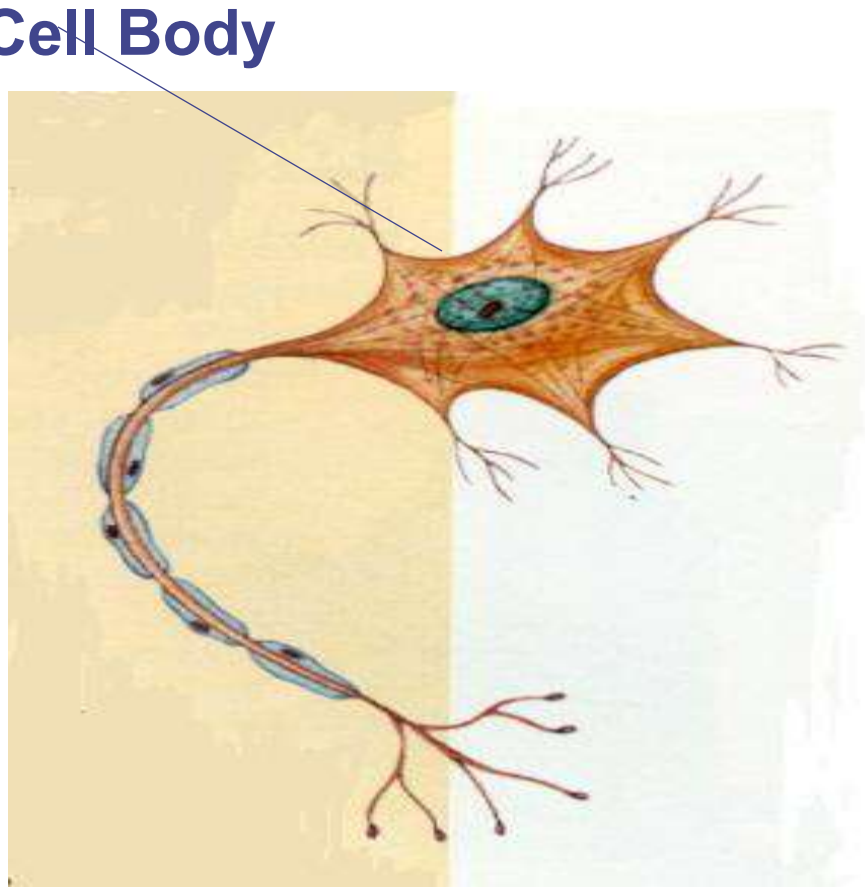
Dendrites

- **Dendrites –**
  Branched parts of a neuron that receive impulses from other neurons.



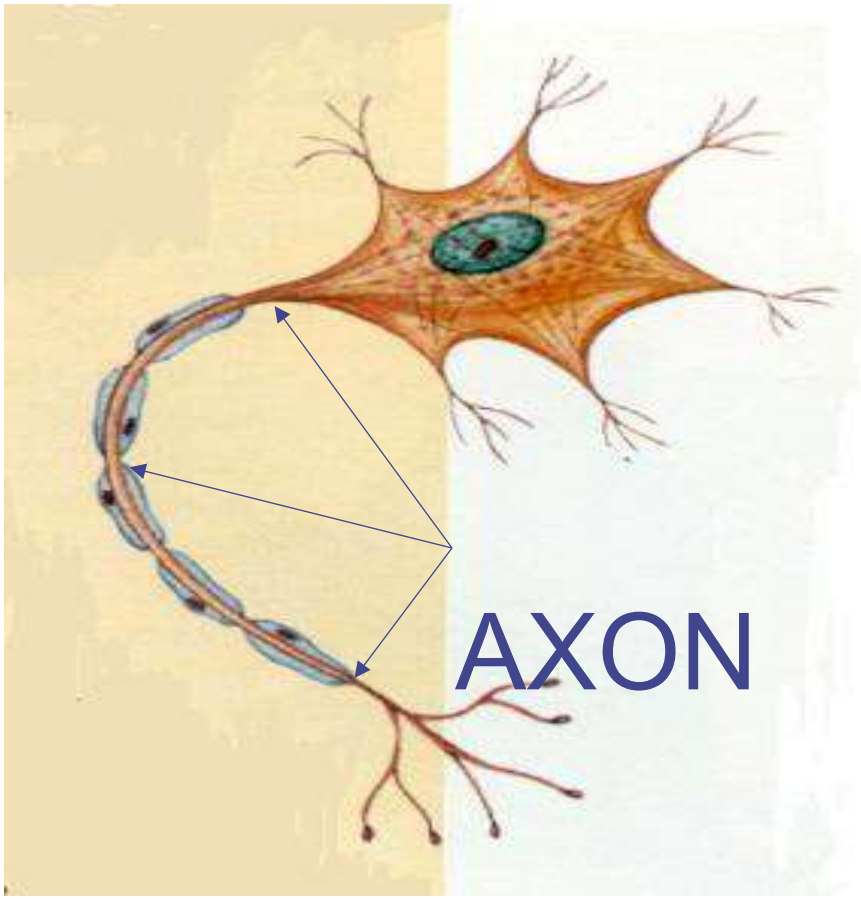
Cell Body

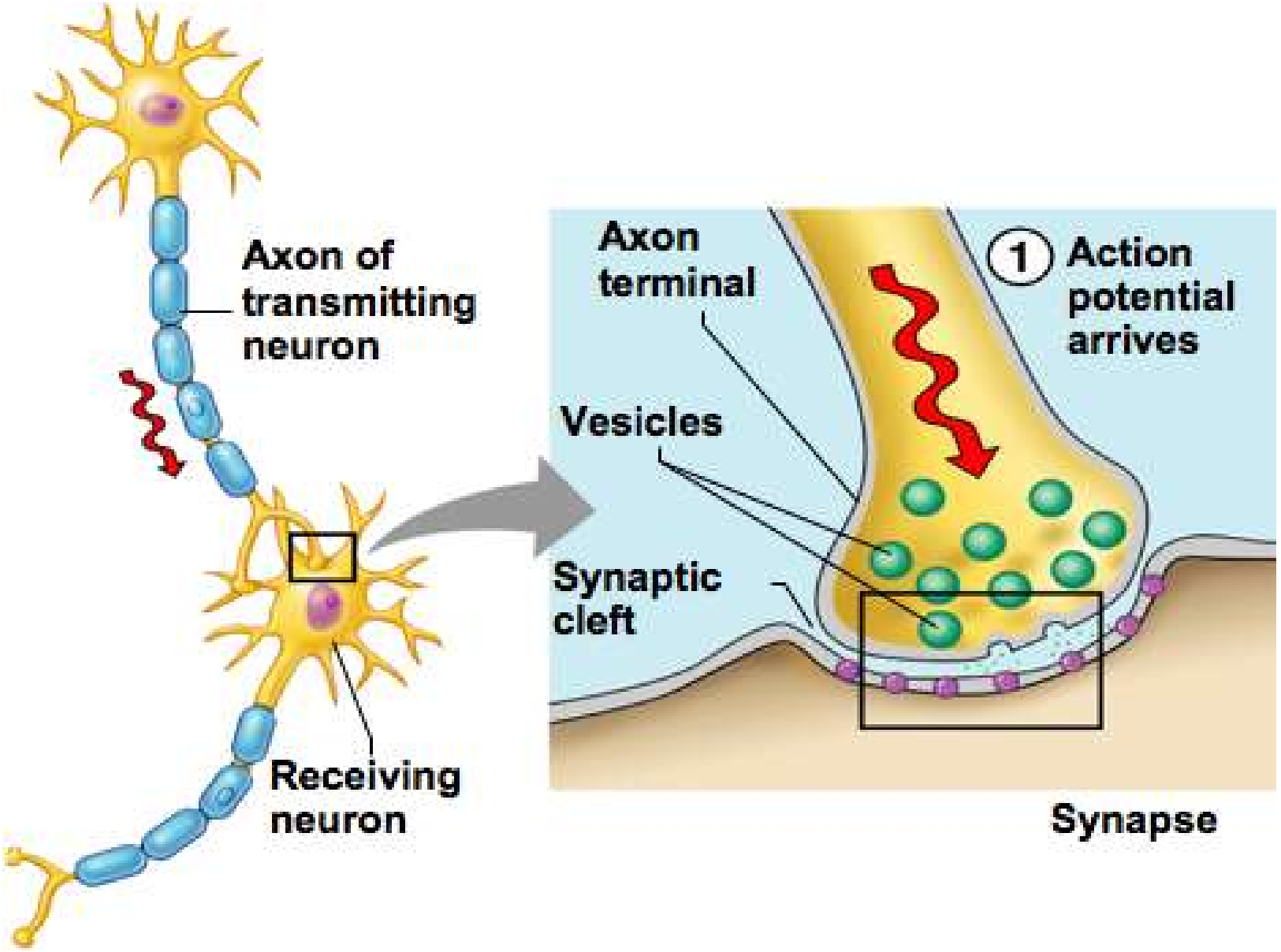
- Contain the nucleus and cytoplasm
- Impulses pass through here to the axon.



AXON

- The axon is a single, long fiber that carries impulses away from the cell body.




Axon of transmitting neuron
Receiving neuron
Axon terminal
1 Action potential arrives
Vesicles
Synaptic cleft
Synapse

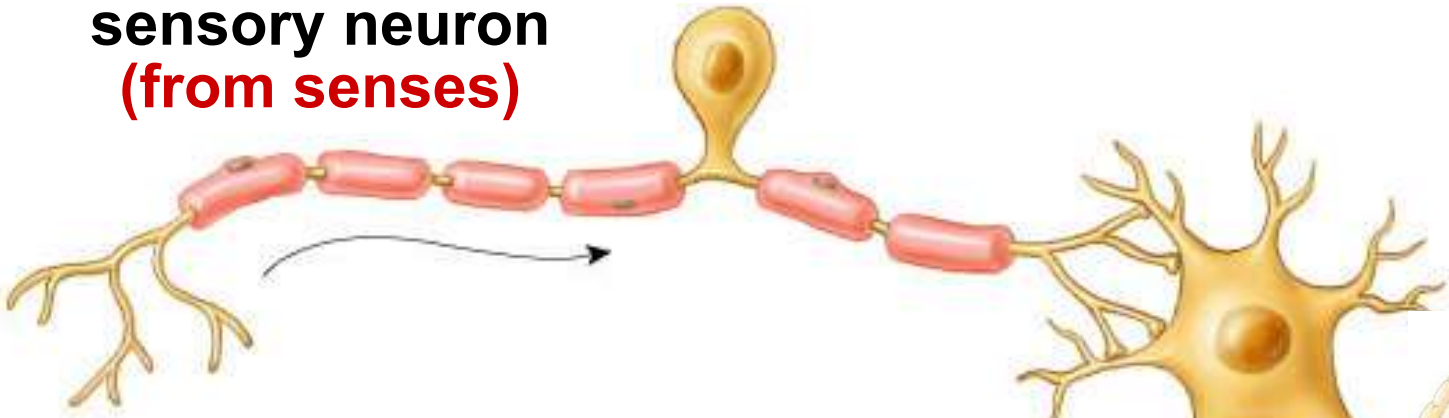
Types of Neurons

Neurons can also be classified by the direction that they send information:

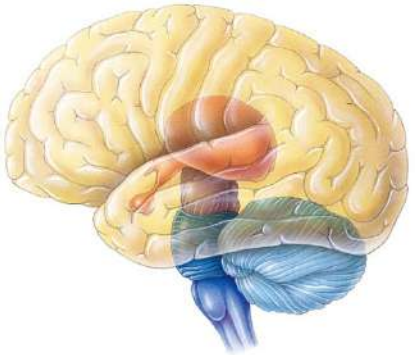
- Sensory (or afferent) neurons: send information from sensory receptors (e.g., in skin, eyes, nose, tongue, ears) TOWARD the central nervous system.
- Motor (or efferent) neurons: send information AWAY from the central nervous system to muscles or glands.
- Interneurons: send information BETWEEN sensory neurons and motor neurons. Most interneurons are located in the central nervous system.

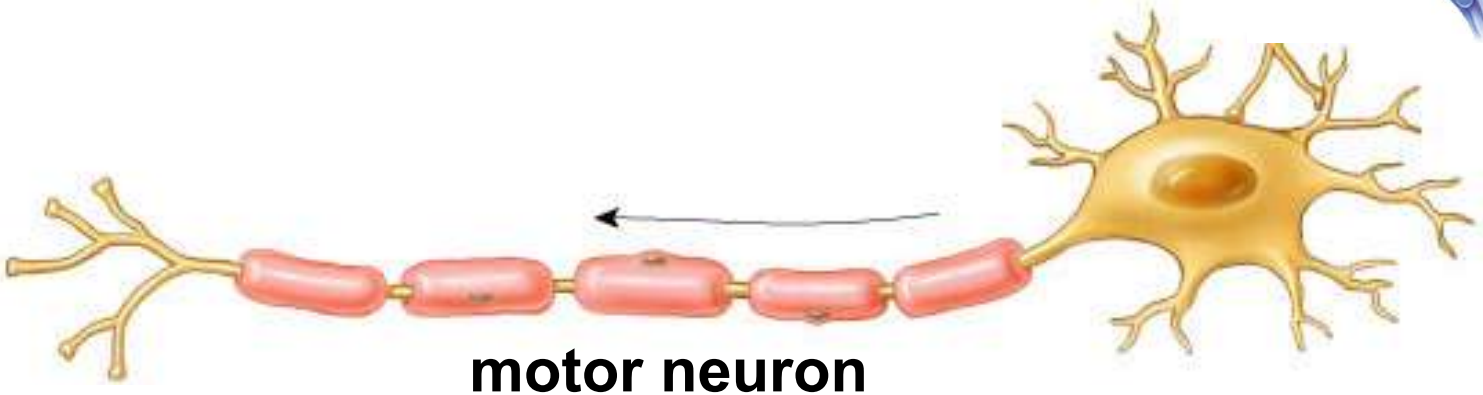
Types of neurons

sensory neuron
(from senses)



interneuron
(brain & spinal chord)





motor neuron
(to muscle)

Reflexes

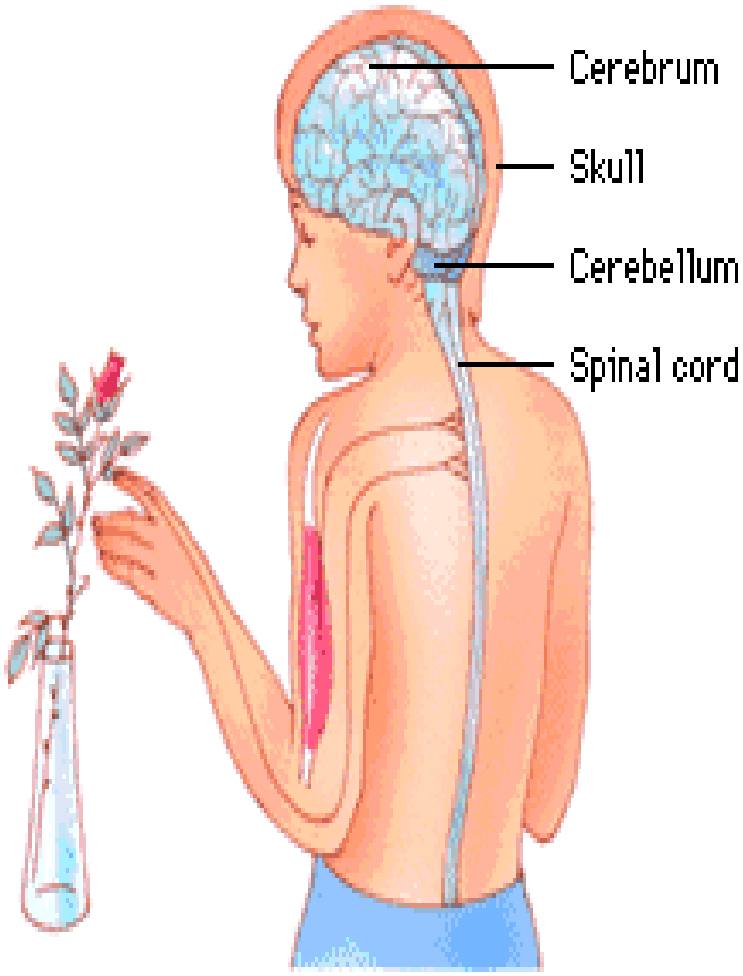
- **Stimulus-** a change in the environment.
- **Reaction-** how the body reacts to a stimulus.
- **Reflex Arc-** the pathway that an impulse follows to illicit a response to a stimulus.

Stimulus

- A stimulus is a specific change in the environment that affects the Nervous system.
- Heat

Impulse

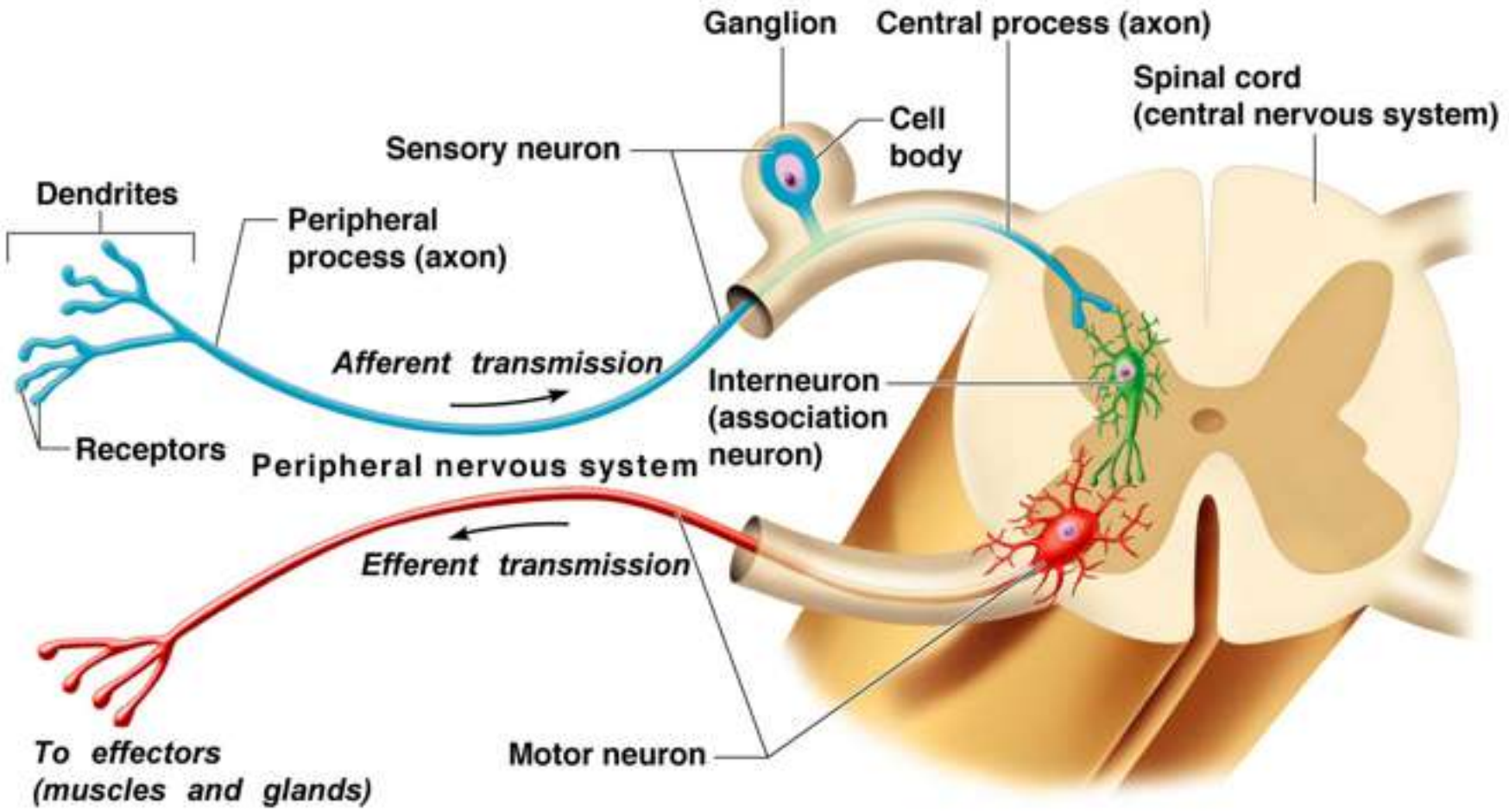
- Impulse is an electrical or chemical message that is carried by nerve cells.



Response

- Reaction to the stimulus
- Quickly moving your hand so it will not burn.

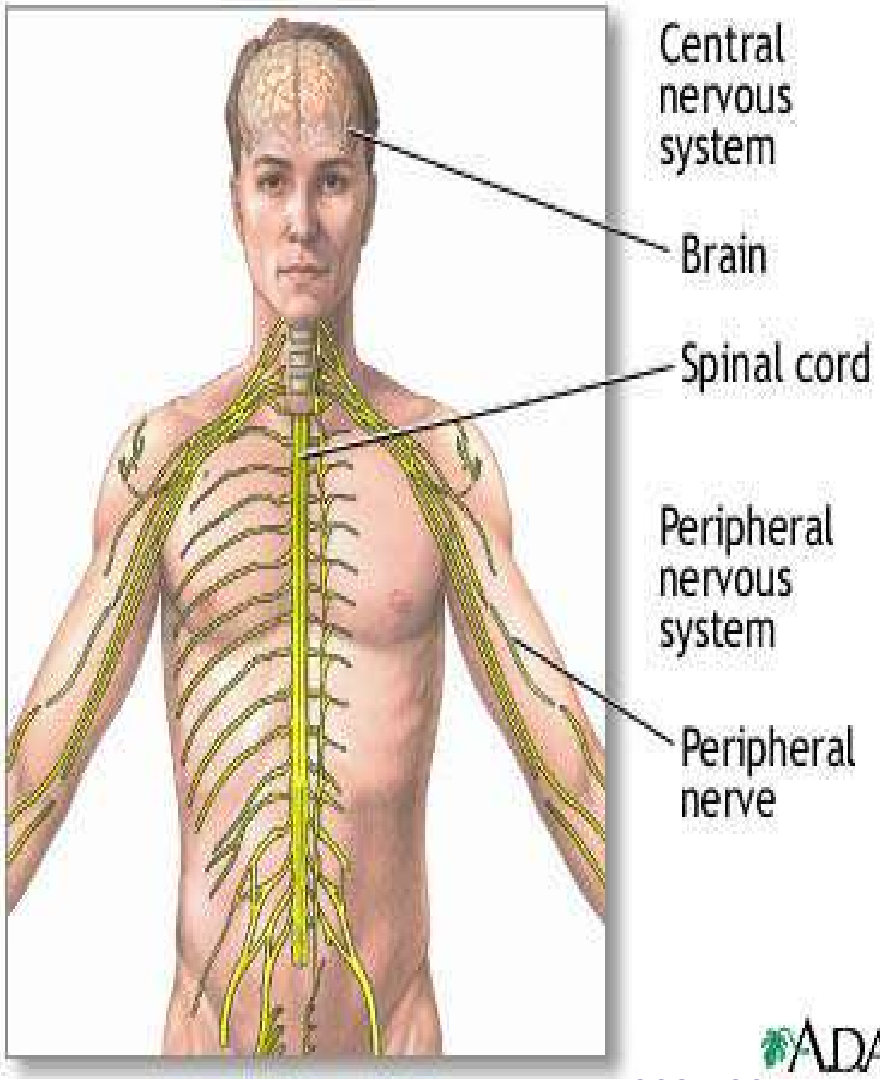
How a Reflex Happens



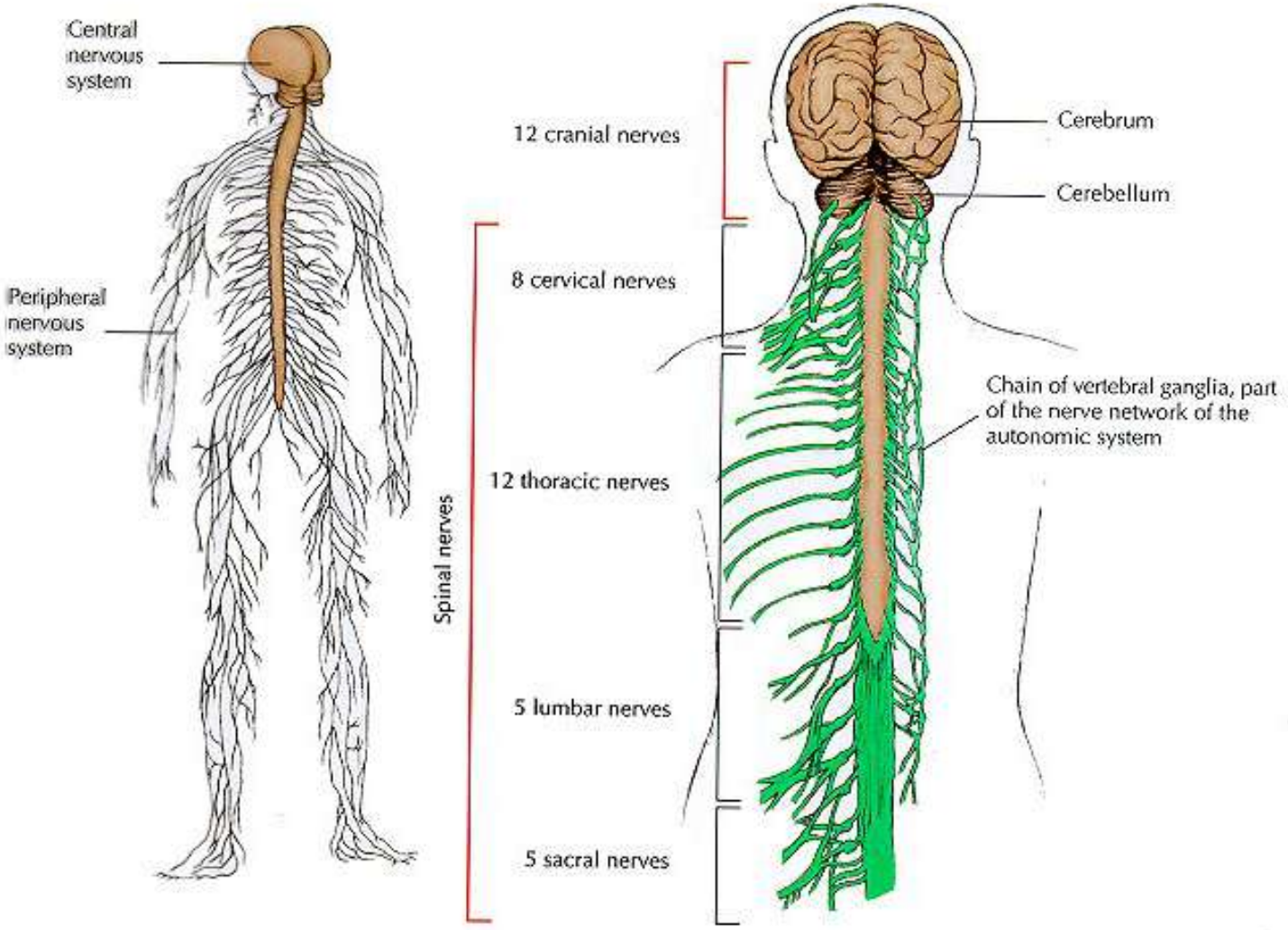
Stop Day 1 NOTES

Human Nervous System

- 2 Parts
- The Central Nervous System (Brain and Spinal Cord)
- The Peripheral Nervous System made up of nerves that lie outside the central nervous system.
- Carries impulses to and from the central nervous system

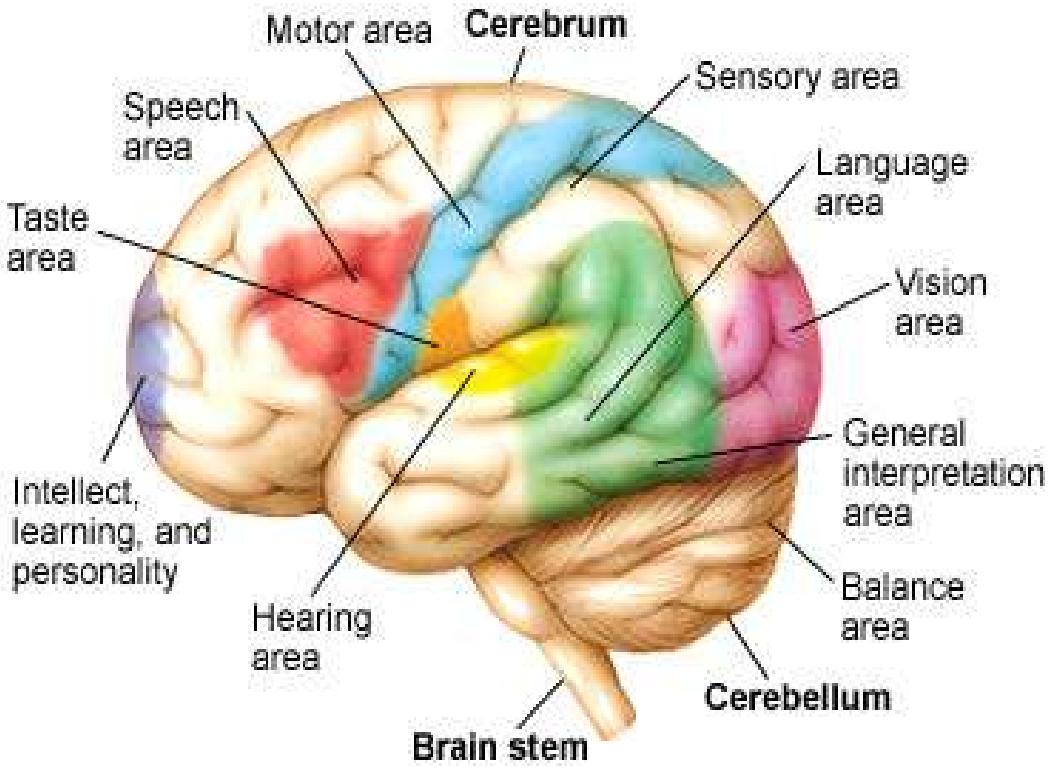


The Central and Peripheral Nervous Systems



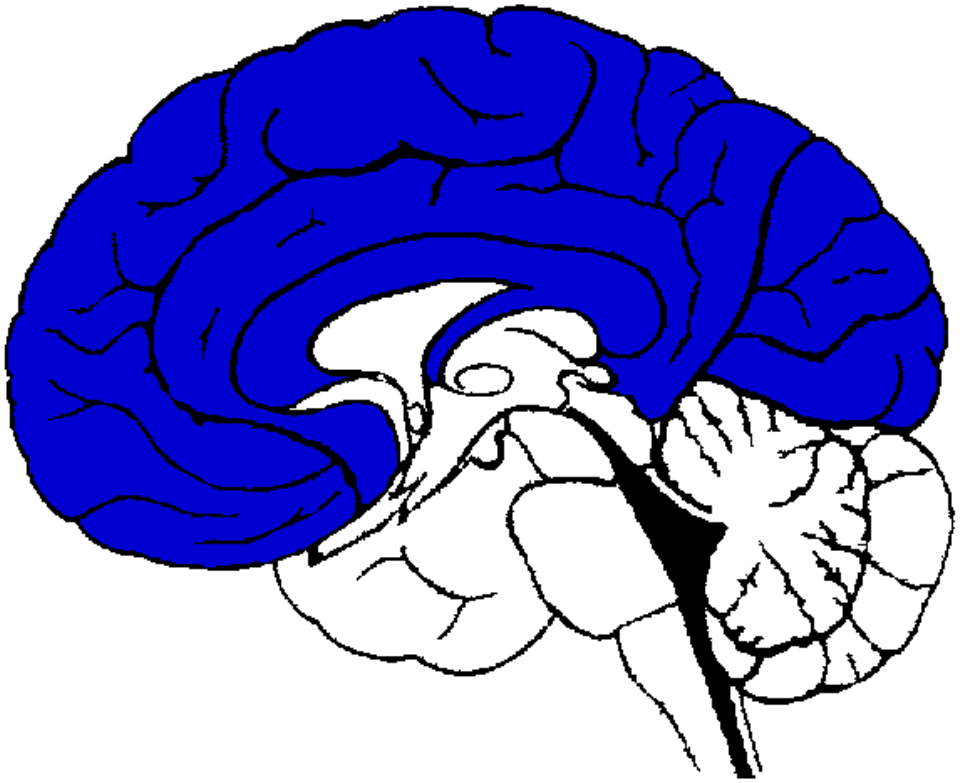
The Brain

- Coordinates body activities
- Made up of approximately 100 billion neurons
- Divided into three major parts-
  - the cerebrum
  - the cerebellum
  - the brain stem.



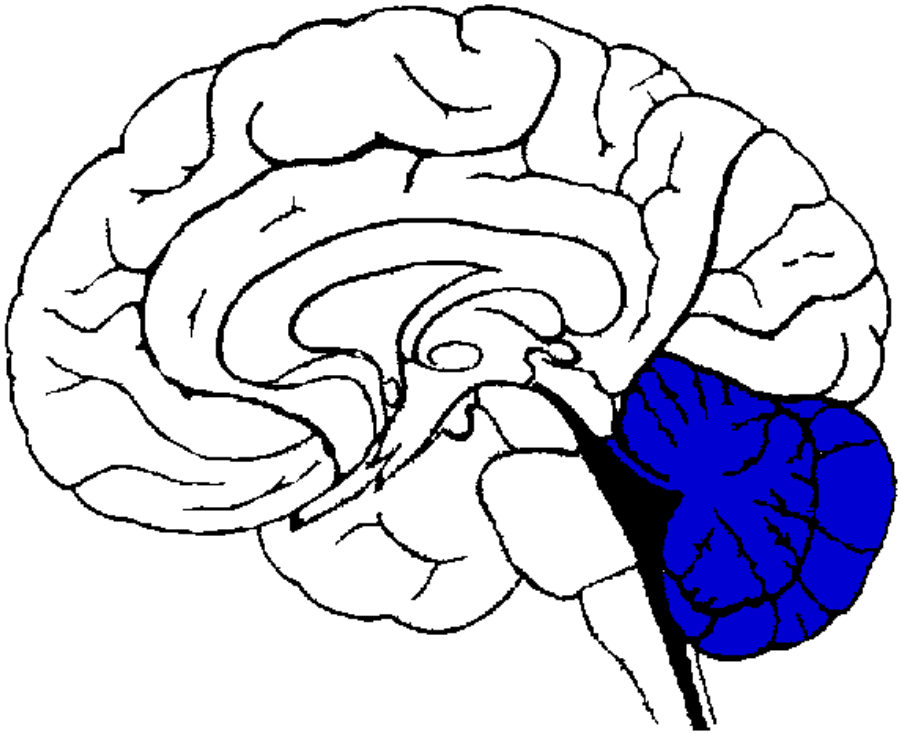
Cerebrum

- Largest part of the brain
- Thinking
- Memory is stored
- Movements are controlled
- Impulses from the senses are interpreted.



Cerebellum

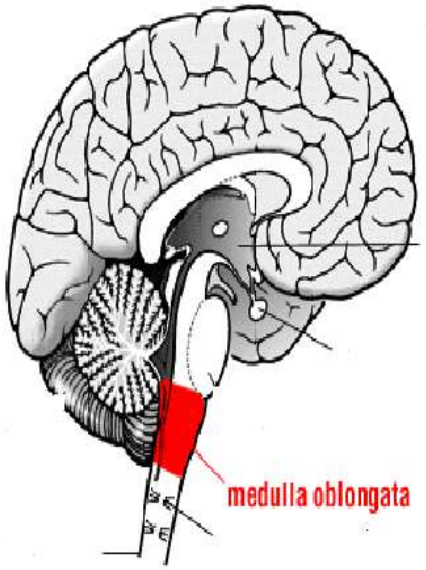
- Interprets stimuli from eyes, ears, muscles
- Controls voluntary muscle movements
- Maintains muscle tone
- Helps maintain balance



Brain StemMedulla

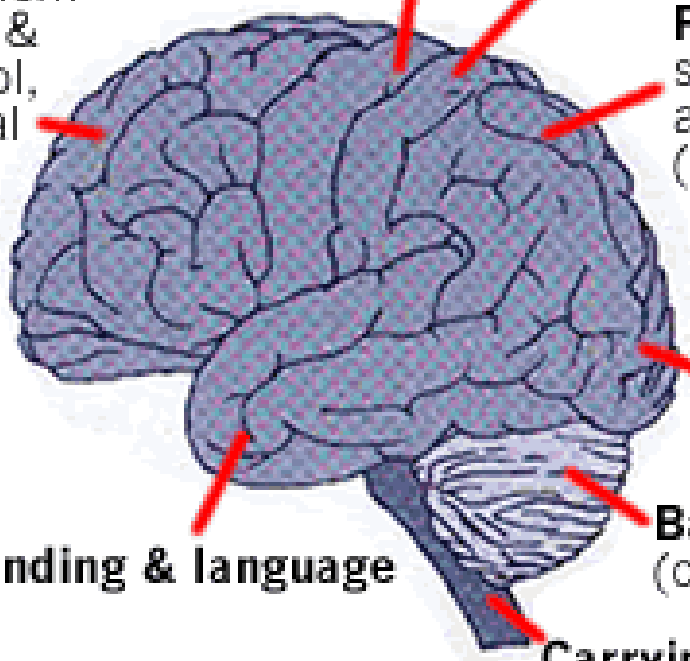
- **Connects brain to spinal cord**
- **Made up of the midbrain, the pons,**
  - **Act as pathways connecting various parts of the brain with each other**
- **Medulla**
  - **controls involuntary actions**

-Center of heart beat, respiration, and other involuntary actions



The Brain and its functions

Based on Diagrams from
Head injury - A Practical Guide By Trevor Powel



Executive functions, thinking, planning, organising & problem solving. Emotions & behavioural control, personality (frontal lobe)

Movement (motor cortex)

Sensation (sensory cortex)

Perception, making sense of the world, arithmetic, spelling (parietal lobe)

Vision (occipital lobe)

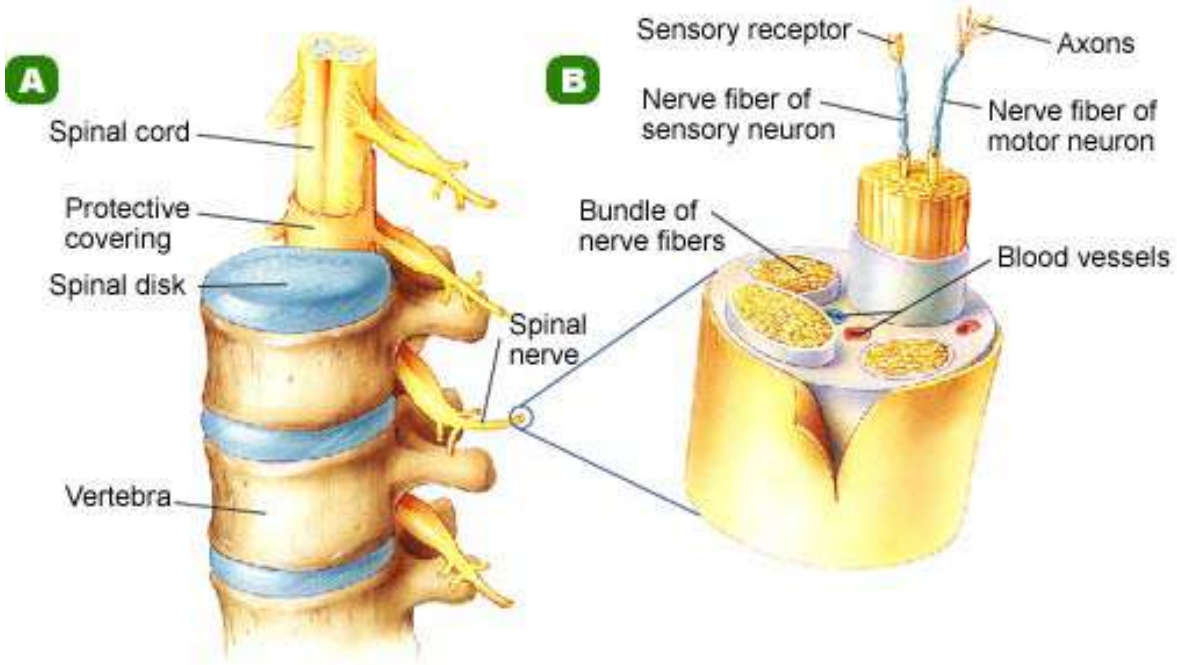
Balance (cerebelium)

Memory, understanding & language (temporal lobe)

Carrying messages (spinal cord)

The Spinal Cord

- Extension of the brain stem
- Bundles of neurons that carry impulses from all parts of the body to the brain and from the brain to all parts of your body



Peripheral Nervous System

- Connects body to brain & spinal cord
- 12 pairs of nerves from your brain (cranial nerves)
- 31 pairs from your spinal cord (spinal nerves)
  - Bundles of sensory and motor neurons held together by connective tissue

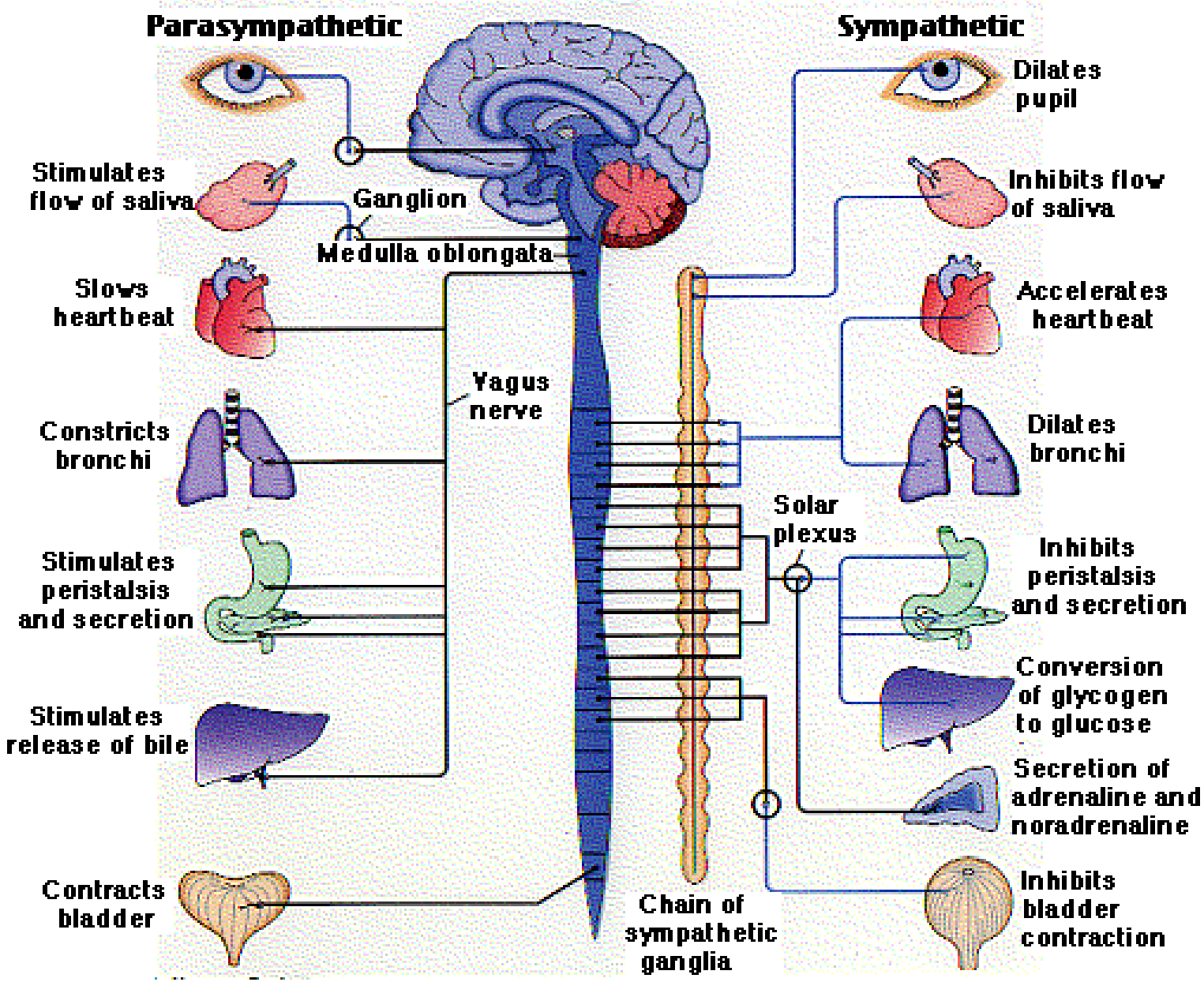
- Two divisions
  - Somatic
  - Autonomic

Somatic Nervous System

- Controls voluntary actions
- Made up of the cranial and spinal nerves that go from the central nervous system to your skeletal muscles

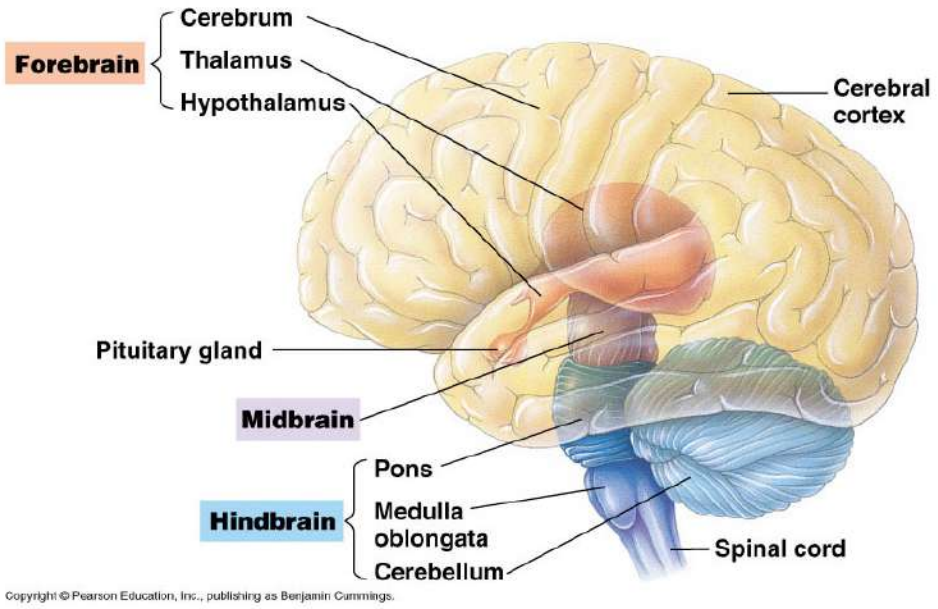
Autonomic Nervous System

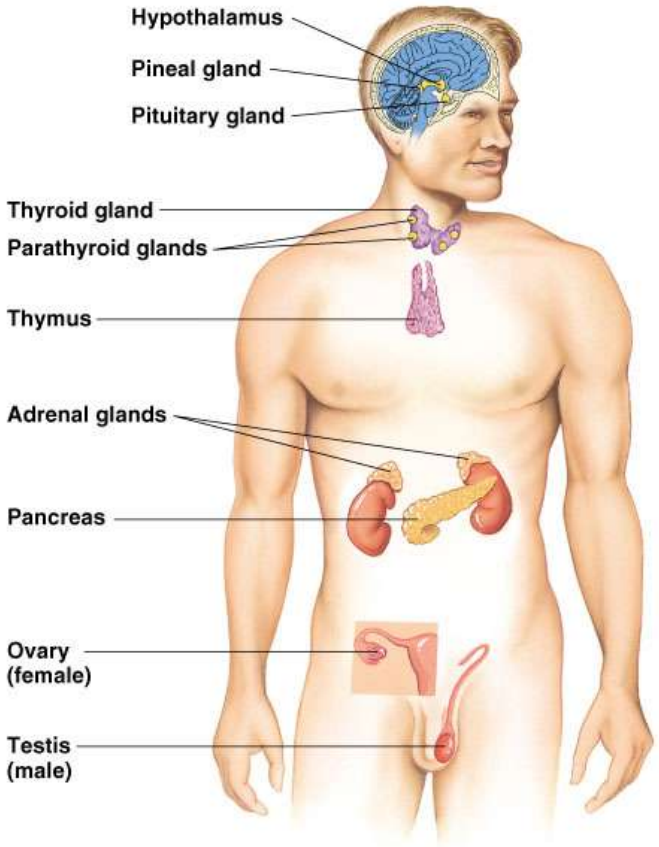
- Controls involuntary actions-those not under conscious control-such as your heart rate, breathing, digestion, and glandular functions


Parasympathetic
Sympathetic
Dilates pupil
Stimulates flow of saliva
Ganglion
Medulla oblongata
Inhibits flow of saliva
Slows heartbeat
Accelerates heartbeat
Vagus nerve
Constricts bronchi
Dilates bronchi
Solar plexus
Stimulates peristalsis and secretion
Inhibits peristalsis and secretion
Conversion of glycogen to glucose
Stimulates release of bile
Secretion of adrenaline and noradrenaline
Contracts bladder
Chain of sympathetic ganglia
Inhibits bladder contraction

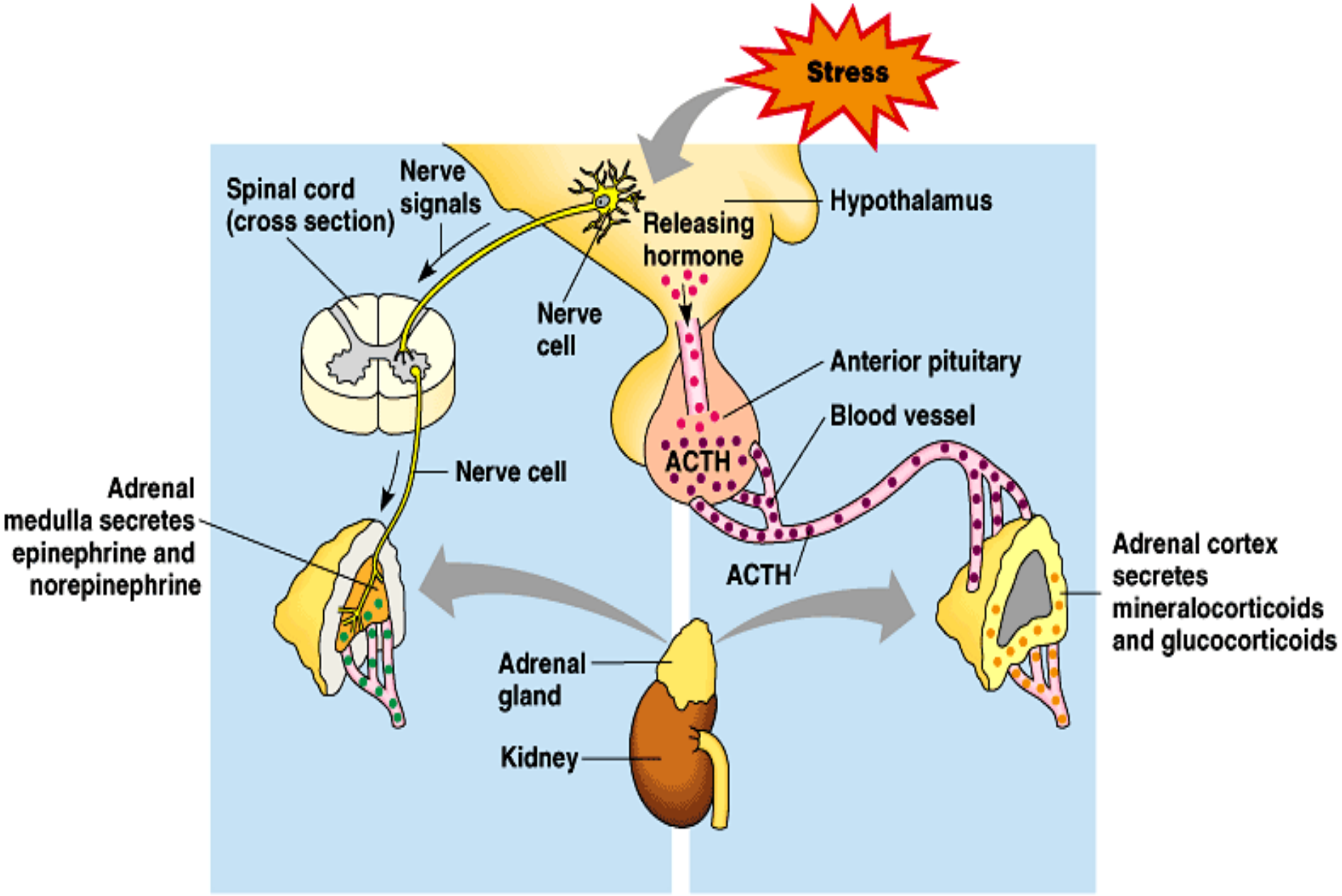
Regulation

1. Control and Coordination of all systems to maintain homeostasis
2. Sense internal and external stimuli and respond



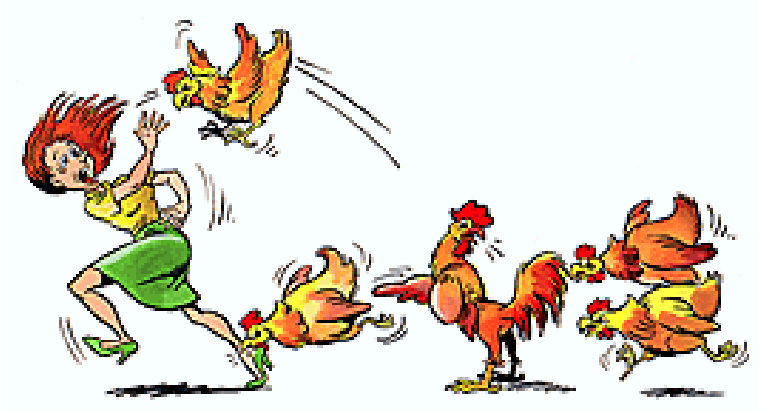


Follow the path for stress response



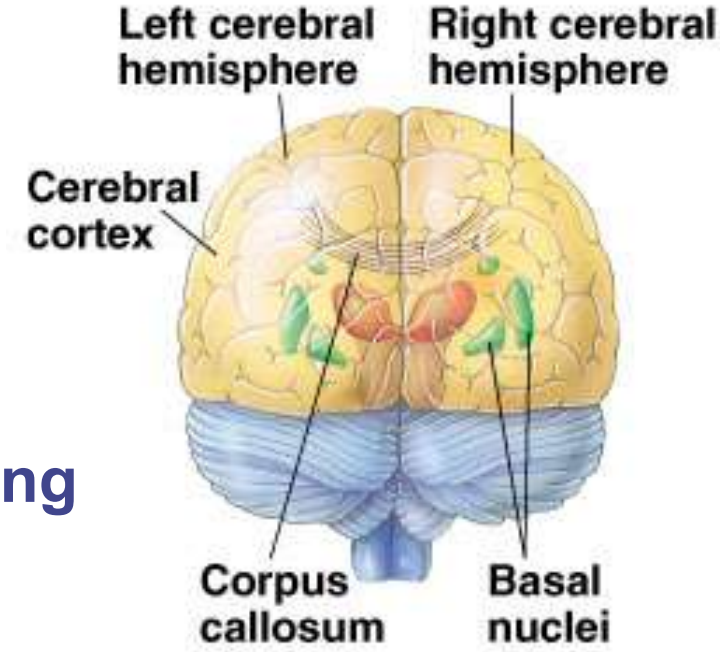
THE FIGHT OR FLIGHT MECHANISM

- Large amount of adrenaline pumped into the body to put us in a state of increased alertness
- Blood is redirected away from the extremities to the large muscles of the body
- The heart starts working harder to move the blood to the large muscle groups as quickly as it can
- Increase in Respiratory Rate
- Release of red blood cells
- Release of sugar by liver
- Increase in metabolic rate



Division of Brain Function

- **Left hemisphere**
  - "logic side"
  - language, math, logic operations, vision & hearing details
  - fine motor control
- **Right hemisphere**
  - "creative side"
  - pattern recognition, spatial relationships, non-verbal ideas, emotions, multi-tasking



(a) Back of brain

Cerebrum specialization

- Regions specialized for different functions
- Lobes
  - frontal
    - speech, control of emotions
    - temporal
  - smell, hearing
    - occipital
  - vision
    - parietal
  - speech, taste reading