Objectives
- To outline the components of the nervous system.
- To label and identify the parts of the brain.
- To introduce the concepts of:
  - Reflex arc
  - Synapse
  - Neurotransmitters

Functions of the Nervous System
- Permits sensory input - Receptors in sensory organs respond to stimuli.
- Integration - The brain makes decisions about information coming in.
- Stimulates Motor Output - Nerve impulses from CNS go to muscles/glands.

Anatomy of a Neuron
I. Dendrites
II. Cell Body
III. Axon

So What is a Nerve?
Answer: A bundle of axons (or could be dendrites) from many different neurons. We can visually see nerves.
Tour of the Brain - CNS

**Cerebrum** - Responsible for consciousness. Divided into hemispheres & association areas that contain “higher” functions like learning/creativity. Composed of primarily gray matter i.e. numerous cell bodies of neurons.
- Convolutions called *gyri*
- Grooves are called *sulci*
- Deep grooves are called *fissures*.

**Cerebellum** - Involved with muscle coordination, integration of impulses received from higher centers. Normal muscle tone & transmitting impulses that maintain posture. Receives and processes information about body position from the inner ear.

Inside the Brain

**Corpus Callosum** - A bridge of myelinated fibers that joins the two hemispheres.

Important for communication in the brain.
**Limbic System** - Lies just below the cerebral cortex & contains neural pathways that connect portions of the frontal lobes, temporal lobes and hypothalamus and thalamus.

- Place of **emotions** like:
  - anger & sorrow
  - pleasure.

Important for individual behaviors that might ensure **survival**. Also important to **learning and memory**.

**The Spinal Cord**

A neural cable that extends from the base of the brain to the lower back. Surrounded and protected by the vertebral column.

Composed primarily of **white matter**, which are aggregates of myelinated axons.

Nerves connect to this important part of the CNS, which relays information to the brain.

**Reflexes**

Automatic, **involuntary responses** to changes occurring inside or outside the body.

Involved in normal body processes like heart beat, body temp, food digestion, sneezing, swallowing, vomiting and urination.
The Synapse

**Junction** of axon ending with the next dendrite of the following neuron.

- **Synaptic cleft** – Gap between neurons.
- **Neurotransmitters** - Chemicals that conduct the nerve impulse across a synapse.

Neurotransmitters

Examples of neurotransmitters
- Acetylcholine
- Norepinephrine
- Seratonin*
- Dopamine*

*Neurotransmitters associated with behavioral states, such as mood, tension, learning and memory.

**Pathway of a Reflex Response**

**Reflex arc**
- Sensory Receptor
  - Sensory Neuron
- Spinal Nerve
  - Spinal Cord
  - Interneuron
- Motor Neuron

**Close-up of a neuromuscular junction (a type of synapse)**

- Arrival of the action potential causes calcium ions (Ca++) to enter an axon terminal.
- Ca++ causes vesicles with signaling molecule (neurotransmitter) to move to the plasma membrane and release their contents by exocytosis.

**Comparative – Nervous System**

- Brain, human
- Brain, fish
- Nervous system of an insect
- 【Vertebrate nervous system】
- 【Invertebrate nervous system】
- 【Invertebrate nervous system】
- 【Vertebrate nervous system】
- 【Vertebrate nervous system】