In addition to the cranial nerves, basic brain anatomy is something that the veterinary technician should be familiar with. This Power Page discusses brain anatomy and important points regarding the nervous system that may be seen on boards.

Central Nervous System (CNS): Comprised of Brain and Spinal Cord

Parts of the Brain

1. **Cerebrum** - conscious thought and perception, largest part of the brain
2. **Cerebellum** - motor control, coordinates movement
3. **Diencephalon:**
   a. **Thalamus**
   b. **Hypothalamus** - controls temperature, thirst, hunger, sleep, etc. Helps to regulate neuroendocrine function and homeostasis of the body.
   c. **Pituitary** - endocrine gland which secretes ACTH, TSH, Growth hormone, Prolactin, LH, and FSH. (The Master Gland)
4. **Brain Stem** - connects the brain to the spinal cord. Origin of most cranial nerves.
   Comprised of 3 parts:
   a. **Medulla Oblongata**
   b. **Pons**
   c. **Midbrain**

Meninges

Meninges cover the brain and spinal cord. The meninges are made up of 3 layers:
- **Dura Mater** - Outer layer of meninges
- **Arachnoid** - Middle layer of meninges
- **Pia Mater** - Inner layer of meninges

Cerebrospinal Fluid

Flows between layers of meninges and helps protect and provide cushion for the brain.
Peripheral Nervous System (PNS)
- The 12 pairs of Cranial Nerves are PNS nerves which originate in the brain. Some are sensory, some are motor, and some are mixed. (See Power Page on Cranial Nerves)
- The 31 pairs of Spinal Nerves start in the spinal cord and have both sensory and motor functions.

The Blood-Brain Barrier
- The blood-brain barrier separates circulating blood from the fluid in the CNS. It functions to prevent toxins from getting to the brain.

Cell Types in the Nervous System
- **Glial Cells** - do not transmit nerve impulses but function to help protect the nervous system. Examples of this cell type are oligodendrocytes (central) and Schwann cells (peripheral).
- **Neurons** - transmit nerve impulses.

Neuron Structure
- The body of the neuron is the **soma**.
- The **axon** conducts the impulse away from the body.
- Axons that are **myelinated**: white matter.
- Neurologic tissue that is **not myelinated**: grey matter.

Autonomic Nervous System
Motor and sensory nerves. Divided into sympathetic and parasympathetic nervous systems.

Sympathetic Nervous System
**Fight or Flight Neurotransmitters**: Adrenergic/catecholamine/epinephrine

When the sympathetic nervous system is stimulated, epinephrine is released and causes increased heart rate, increased blood pressure, **pupil dilation** (mydriasis), increase respiration, bronchodilation, and decreased gastrointestinal activity. **Can be triggered by fear, stress, excitement, exercise, etc.**
Parasympathetic Nervous System

Rest and Digest Neurotransmitters: Cholinergic/acetylcholine

Controls normal homeostasis. Acetylcholine is released in a rested state, causing decreased heart and respiratory rate, pupil constriction (miosis), increased salivation and gastrointestinal activity. SLUD - salivation, lacrimation, urination, defecation.

Communication

- Cells communicate via the sodium-potassium pump. **Sodium moves out of the cell and potassium goes back into the cell.**
- **At Rest** (Resting Membrane Potential): The cell is negative on the inside (K+) and positive on the outside (Na+). This causes a charge across the cell membrane.
- **Firing of the cell is Depolarization.** When this occurs **sodium channels open and sodium flows into the cell** (now the cell is positive -“action potential”).
- **Repolarization** occurs when the sodium channels close and potassium channels open. Now **potassium is moved back into the cell and sodium is pushed out.** The cell holds a negative charge again.

References