Syrian Private University
Medical Faculty

Medical Terminology

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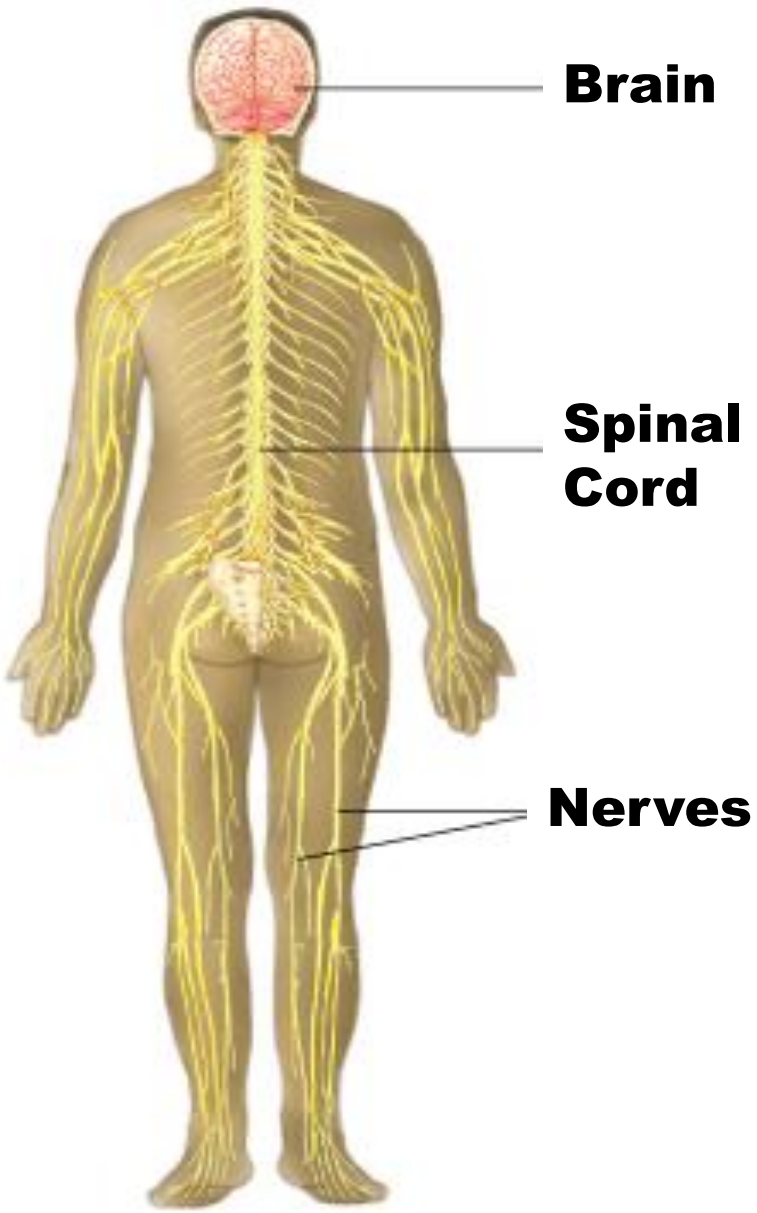
Lecture 12

The Nervous System



Objectives

After studying this chapter, you will be able to:

- **Name the parts of the nervous system and discuss the function of each part.**
- **Define the combining forms used in building words that relate to the nervous system.**
- **Identify the meaning of related abbreviations.**
- **Name the common diagnoses, laboratory tests, and clinical procedures used in testing and treating disorders of the nervous system**

Objectives cont'd

- **Define the major pathological conditions of the nervous system.**

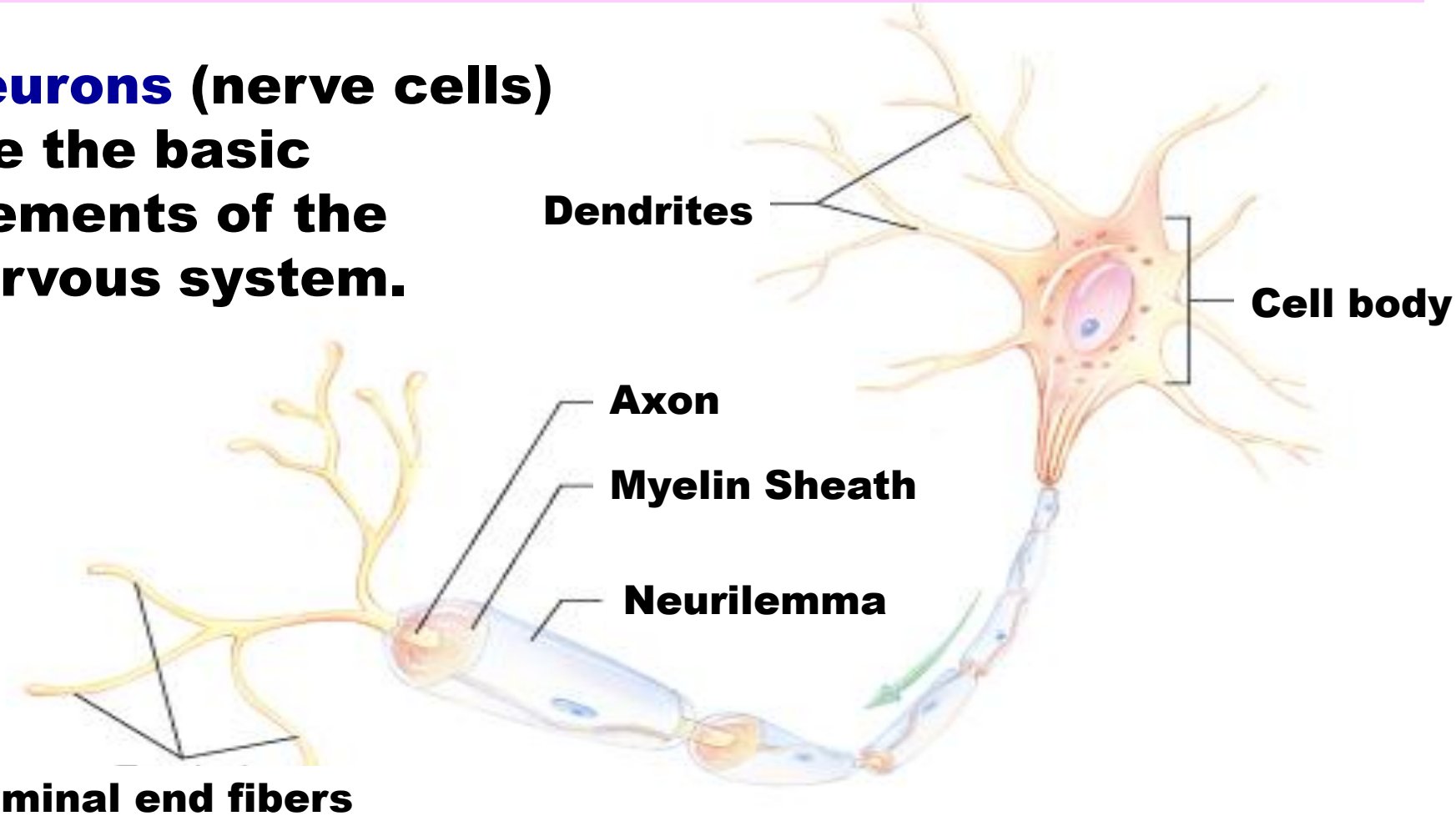
- **Define surgical terms related to the nervous system.**

- **Recognize common pharmacological agents used in treating disorders of the nervous system**

Structure and Function

All bodily activities, voluntary and involuntary, are controlled by the nervous system.

Neurons (nerve cells) are the basic elements of the nervous system.



Structure and Function

Cell Body

- The main processing center of the cell

Dendrites

- Thin branching extensions of the cell body that conduct nerve impulses ***toward*** the cell body.

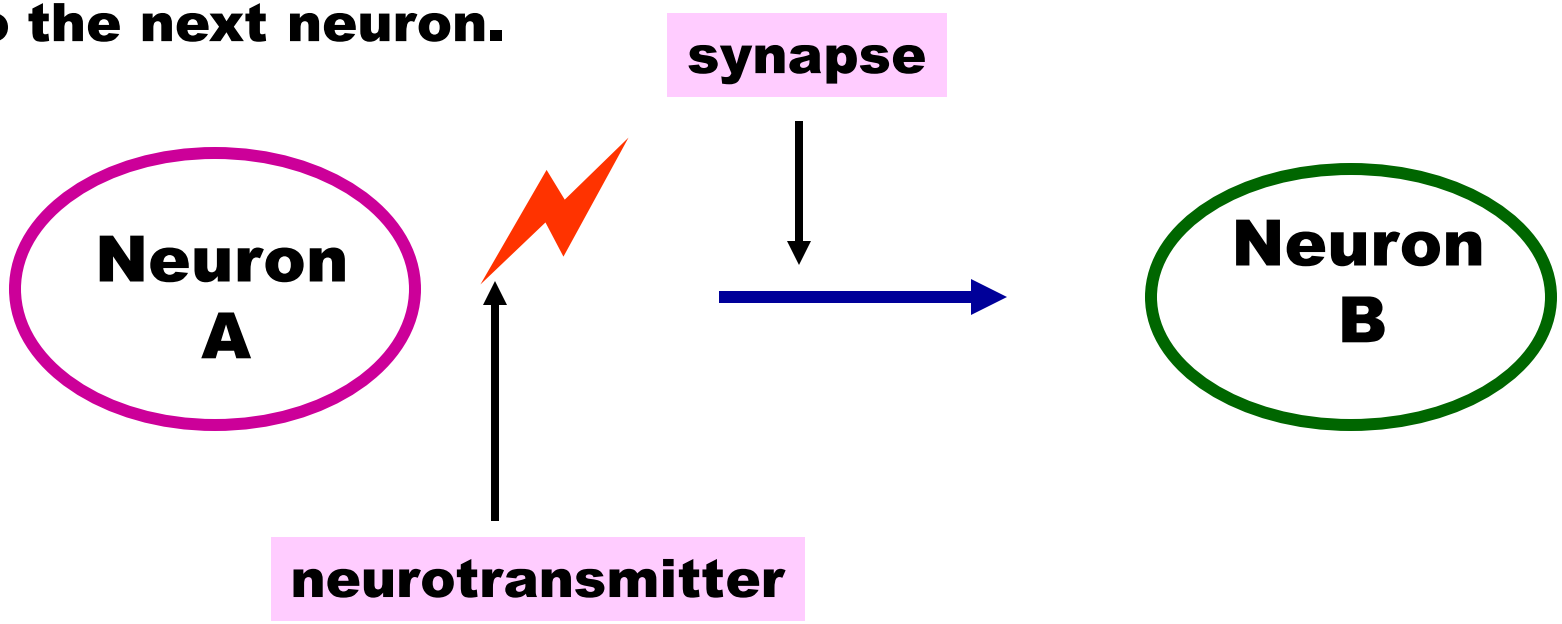
Axon

- A single branch (in most neurons) which conducts nerve impulses ***away*** from the cell body.
- **Myelin sheath** and **neurilemma** are coverings.

Structure and Function

Impulse Transmission

Terminal end fibers are located at the ends of the axon and they transmit impulses leaving the neuron across a **synapse** to the next neuron.



All neurons have two basic properties → excitability, conductivity

Structure and Function

Three Types of Neurons

- **Efferent** (motor)

Conveys information from the CNS to muscles and glands

- **Afferent** (sensory)

Carry information from sensory receptors to the CNS

- **Interneurons**

Carry and process sensory information

Other Cells (Neuroglia)

Support, protect, connect and remove debris from the nervous system

Structure and Function

Types of Neuroglial Cells

Astrocytes

- Star-shaped cells that maintain the nutrient and chemical levels in neurons

Oligodendroglia

- Produce myelin and help in supporting the neurons

Microglia

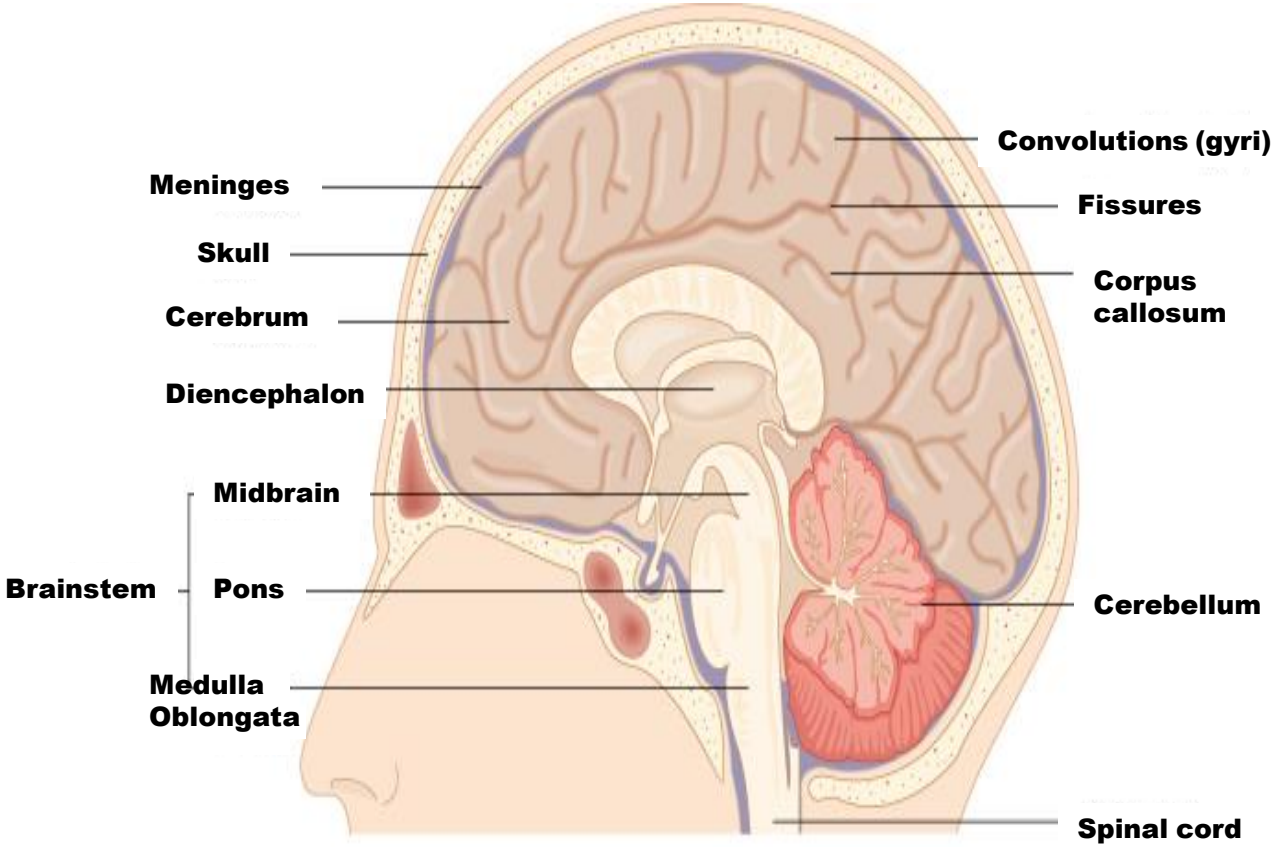
- Phagocytes, they remove debris

Structure and Function

Central Nervous System

- Consists of the **brain** and **spinal cord**
- The control center of the body responsible for **controlling**, **receiving**, and **interpreting** all stimuli
- Sends nerve impulses to instruct muscles and glands to take or respond to certain actions
- Both **voluntary** and **involuntary** movements are controlled

Structure and Function



Brain

- Weighs about 3 pounds in adults
- 75% water
- Contains over 100 billion neurons
- Controls bodily functions and interactions with the outside world

Divisions of the Brain

- Brainstem
- Cerebellum
- Diencephalon
- Cerebrum

Structure and Function

Brainstem

Made up of the midbrain; pons and the medulla oblongata

Midbrain

- Involved with visual reflexes

Pons

- Located between the midbrain and the medulla oblongata
- Controls certain respiratory functions

Medulla Oblongata

- Contains centers that regulate heart and lung functioning, swallowing, coughing, vomiting and sneezing

Structure and Function

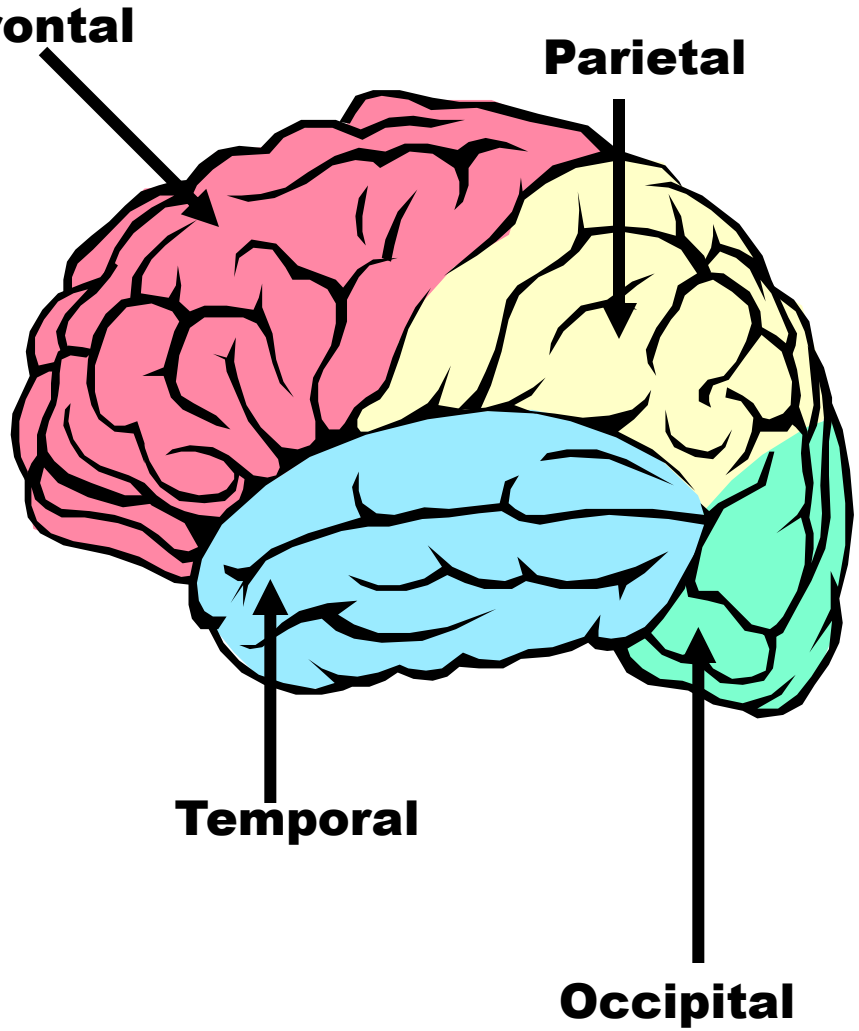
Cerebellum

Area that coordinates musculoskeletal movement to maintain posture, balance, and muscle tone

Structure and Function

Cerebrum

- Located above the cerebellum
- Contains two hemispheres with an outer portion called the **cerebral cortex**
- The two hemispheres are connected by a bridge of nerve fibers that relay information between the two hemispheres called the **corpus callosum**
- The left and right lobes are each divided into four lobes or parts:
  - parietal lobe
  - frontal lobe
  - temporal lobe
  - occipital lobe



Structure and Function

Diencephalon

The deep portion of the brain containing:
-thalamus
-hypothalamus
-epithalamus
-ventral thalamus

Functions

- **Serves as relay center for sensations**
- **Integrates with the ANS in the control of:**

Heart rate **Blood pressure** **Temperature control**

Behavioral responses **Digestive functions**

Water and electrolyte balance **Glandular activities**

Structure and Function

The brain sits inside a protective bony structure called the cranium and is surrounded by a watery fluid, cerebrospinal fluid (CSF), that cradles and cushions the brain. Ventricles or cavities in the brain also contain this CSF.

Spinal Cord

- **Extends from the medulla oblongata of the brain to the area around the first lumbar vertebra in the lower back**
- **Nerves from the peripheral nervous system extend out from the spinal cord**
- **Protected by:**
  - **vertebral column**
  - **cerebrospinal fluid**
  - **meninges**

Structure and Function

Meninges are three layers of membranes that cover the brain and spinal cord.

Layers of the meninges

dura mater

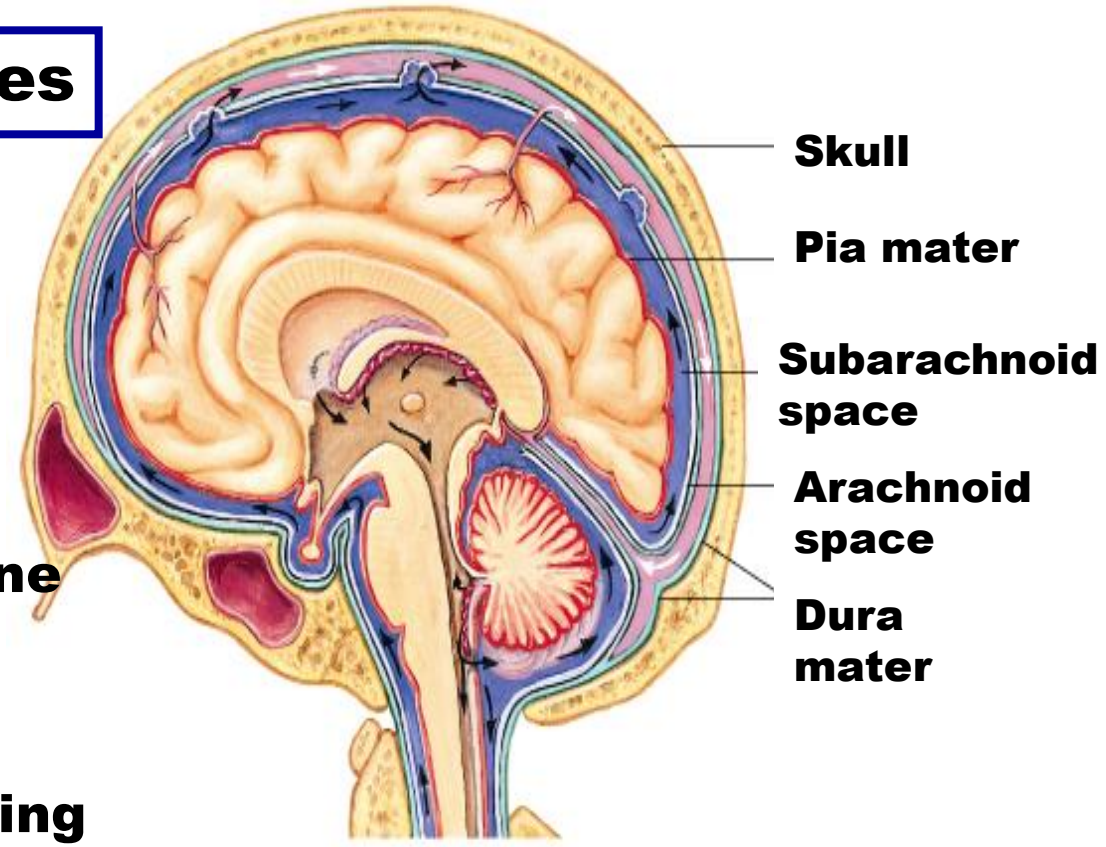
- Outer tough fibrous membrane

arachnoid mater

- Middle weblike membrane containing CSF

pia mater

- Innermost layer containing several blood vessels



Structure and Function

Peripheral Nervous System

Consists of 12 pairs of cranial nerves and 31 pairs of spinal nerves

Cranial Nerves	Function
I olfactory	Sense of smell
II optic	Sense of vision
III oculomotor	Eye movements
IV trochlear	Aids muscles that move the eyes
V trigeminal	Eyes, tear glands,scalp, forehead,teeth, gums, lips, and mouth muscles

Structure and Function

Cranial Nerve	Function
VI abducens	Muscle conditioning
VII facial	Taste, facial expressions, tear and salivary glands
VIII vestibulocochlear	Hearing and equilibrium
IX glossopharyngeal	Pharynx, tonsils tongue and carotid arteries; stimulates salivary glands
X vagus	Speech, swallowing, heart muscle, smooth muscle and certain glands
XI accessory	Muscles of the soft palate, pharynx, larynx and neck
XII hypoglossal	Tongue movement

Structure and Function

Somatic Nervous System

- Responsible for receiving and processing sensory input from the skin, muscles, tendons, joints, eyes, tongue, nose and ears as well as excite the voluntary contraction of skeletal muscles.

Autonomic Nervous System

- Carries impulses from the central nervous system to glands, various smooth muscles, cardiac muscle and various membranes.
- Stimulates organs, glands, and senses.

Structure and Function

Sympathetic Division of ANS

- Operates when the body is under **stress** to activate responses necessary to react to dangerous situations.

Parasympathetic Division of ANS

- Operates to keep the body in homeostasis or balance under **normal conditions**.

Combining Forms and Abbreviations

Combining Form	Meaning
cerebell (o)	cerebellum
cerebr (o)	cerebrum
crani (o)	cranium
encephal (o)	brain
gangli (o)	ganglion
gli (o)	neuroglia
mening (o)	meninges

Combining Forms and Abbreviations

Combining Form	Meaning
myel (o)	bone marrow, spinal cord
neur (o)	nerve
spin (o)	spine
thalam (o)	thalamus
vag (o)	vagus nerve
ventricul (o)	ventricle

Combining Forms and Abbreviations

Abbreviation	Meaning
Ach	acetylcholine
ALS	amyotrophic lateral sclerosis
BBB	blood-brain barrier
CNS	central nervous system
CP	cerebral palsy
CSF	cerebrospinal fluid

Combining Forms and Abbreviations

Abbreviation	Meaning
CAT scan	computerized (axial) tomography
CVA	cerebrovascular accident
CVD	cerebrovascular disease
EEG	electroencephalogram
ICP	intracranial pressure
LP	lumbar puncture

Combining Forms and Abbreviations

Abbreviation	Meaning
MRA	magnetic resonance angiography
MRI	magnetic resonance imaging
MS	multiple sclerosis
SAH	subarachnoid hemorrhage
TIA	transient ischemic attack

Diagnostic, Procedural and Laboratory Terms

Electrodiagnostic Procedures

Electroencephalogram (EEG)

- A record of the brain's electrical impulses.
- Capable of detecting abnormalities that signal certain neurological conditions.

Nerve Conduction Velocity

- Procedure where peripheral nerves are shocked while timing the conduction.

Polysomnography (PSG)

- A recording of electrical and movement patterns during sleep to diagnose sleep disorders.

Diagnostic, Procedural and Laboratory Terms

Imaging Procedures

Magnetic resonance imaging (MRI)

- The use of magnetic fields and radio waves to visualize structures.

Magnetic resonance angiography (MRA)

- The imaging of blood vessels to detect various abnormalities.

Positron emission tomography (PET)

- Procedure that produces brain images using radioactive isotopes and tomography.

Computerized (axial) tomography (CAT) scans

- Tomography used to show cross-sectional radiographic images.

Diagnostic, Procedural and Laboratory Terms

X-Ray Procedures

Myelogram

- An x-ray of the spinal cord after a contrast medium is injected.

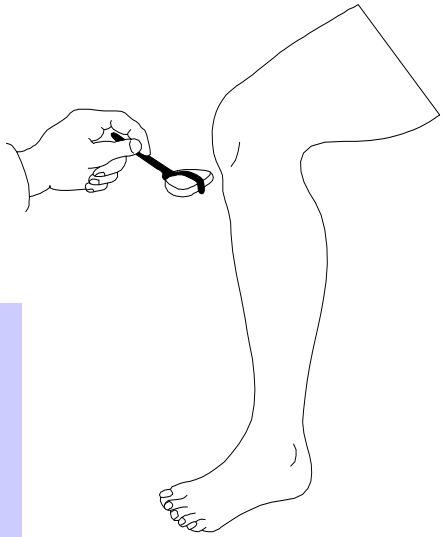
Cerebral angiogram

- X-rays of the brain's blood vessels after a contrast medium is injected.

Encephalography

- Radiographic study of the ventricles of the brain.

Diagnostic, Procedural and Laboratory Terms



Reflexes are involuntary muscular contractions in response to a stimulus.

Babinski's reflex is a reflex on the plantar surface of the foot.

Patellar (Knee) reflexes are usually tested for responsiveness.

Cerebrospinal fluid can also be withdrawn and tested for the presence of various substances that signal certain diseases.

Pathological Terms

Conditions Caused By Trauma

Concussion

- Injury to the brain from an impact with an object.

Contusion

- A bruising of the surface of the brain without penetration into the brain.

Subdural hematoma

- A tumor-like collection of blood often caused by trauma in which there is bleeding in the dura mater and the arachnoid or at the base of the dura.

Pathological Terms

Congenital Disorders

Spina Bifida

- Defect of the spinal column.
- **Meningocele** is the protrusion of the spinal meninges above the surface of the skin.
- **Meningomyelocele** is the protrusion of the meninges and spinal cord.

back of infant with meningomyeloocele

Tay-Sachs

- Genetic disease characterized by an enzyme deficiency that causes deterioration in the CNS's cells

Hydrocephalus

- Overproduction of the CSF in the brain

Pathological Terms

Degenerative Conditions

Alzheimer's Disease

- Progressive degeneration of neurons in the brain, eventually leading to death.

Amyotrophic Lateral Sclerosis

- Also known as Lou Gehrig's disease
- Degenerative disease of the motor neurons leading to loss of muscular control and death.

Huntington's Chorea

- Hereditary disease with uncontrollable, jerking movements and progressive loss of neural control.

Pathological Terms

Degenerative Conditions cont'd

Multiple Sclerosis (MS)

- Destruction of the myelin sheath leading to muscle weakness, unsteady gait, paresthesia, extreme fatigue, and some paralysis.

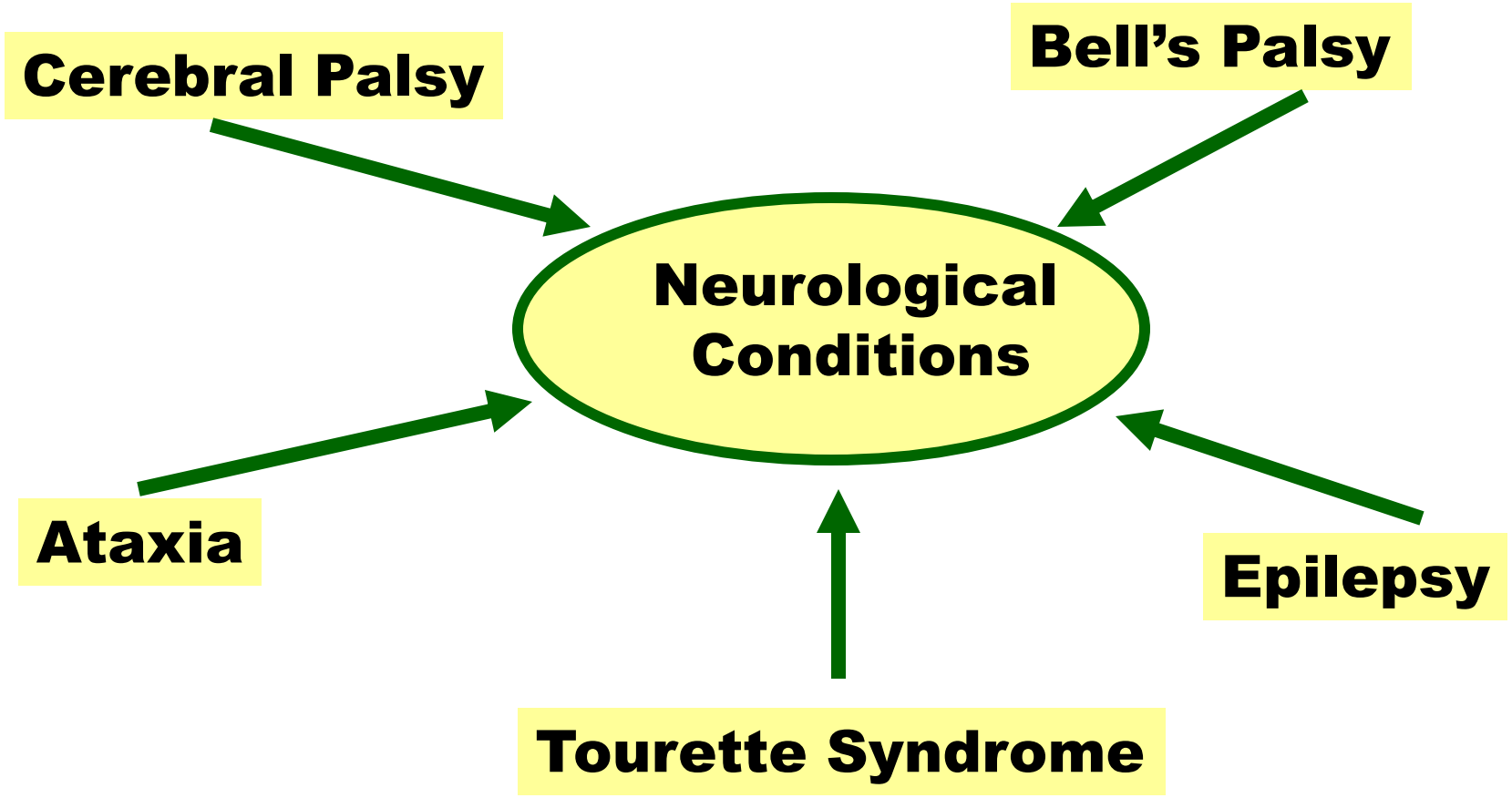
Myasthenia Gravis

- Condition of muscle weakness due to an overproduction of antibodies that block neurotransmitters from sending proper nerve impulses to skeletal muscles.

Parkinson's Disease

- Degeneration of nerves in the brain which causes tremors, weakness of muscles, and difficulty walking.

Pathological Terms



Pathological Terms

Infectious Conditions

Shingles

- A viral disease caused by the herpes zoster virus.

Meningitis

- Caused by bacteria and viruses
- Bacterial causes can be fatal

Inflammatory Conditions

- Neuritis
- Encephalitis
- Duritis
- Myelitis
- Radiculitis
- Sciatica

Pathological Terms

Abnormal Growth

Gliomas

- Tumors that arise from neuroglia

Meningiomas

- Tumors that arise from the meninges

Ganglion

- Any group of nerve cells bunched together to form a cyst

Vascular Conditions

- Cerebrovascular accident (CVA)
- Transient ischemic attacks (TIA)

Surgical Terms

Neurosurgeons are the physicians that perform surgery on the brain and spinal cord.

Surgical Procedures

Lobectomy

- Removal of a portion of the brain

Craniectomy

- Removal of part of the skull

Neuroplasty

- Surgical repair of a nerve

Neurectomy

- Surgical removal of a nerve

Pharmacological Terms

Analgesics

•Relieve pain

Anticonvulsants

•Treat epilepsy

Narcotics

•Relieve pain by inducing a stuporous or euphoric state

Sedatives & Hypnotics

•Relax the nerves and sometimes induces sleep

Anesthetics

•Numb the body locally (one section), or general (entire body)

Apply Your Knowledge

Injury to which of the following parts of the brain will most likely lead to balance and coordination problems?

A. medulla oblongata

B. cerebellum

C. cerebrum

Answer : B. cerebellum

Apply Your Knowledge

Anthony is on his way home from a friend's house when several wild dogs begin to chase him. As he runs, his heart rate and respiration all increase.

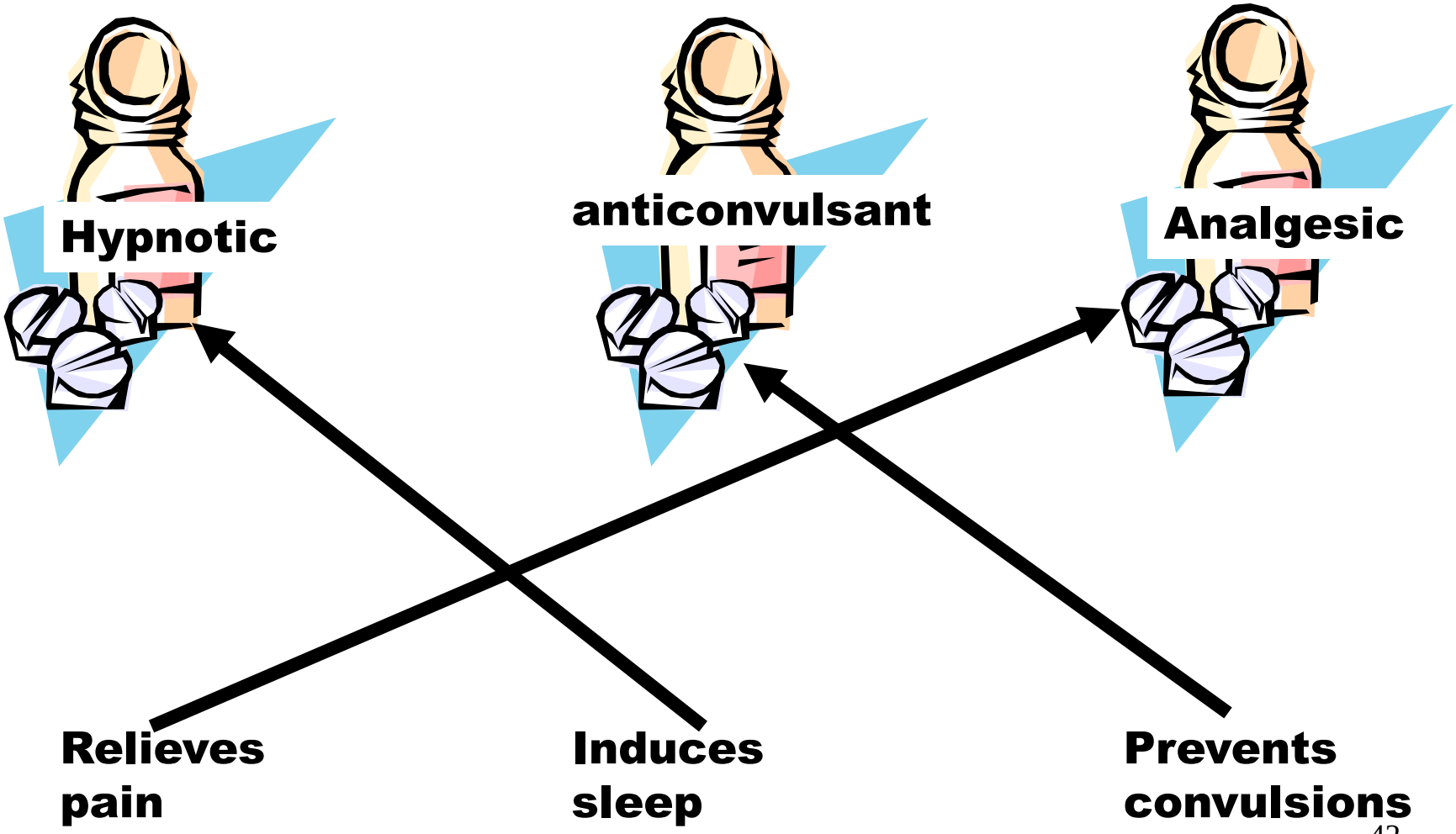
Which of the following nervous system controls were responsible for preparing his body to run due to his fear?

A. central nervous system
B. parasympathetic nervous system
C. sympathetic nervous system

Answer: C. sympathetic nervous system

Apply Your Knowledge

Match each description with the correct medication.



Apply Your Knowledge

Identify the labeled lobes of the brain