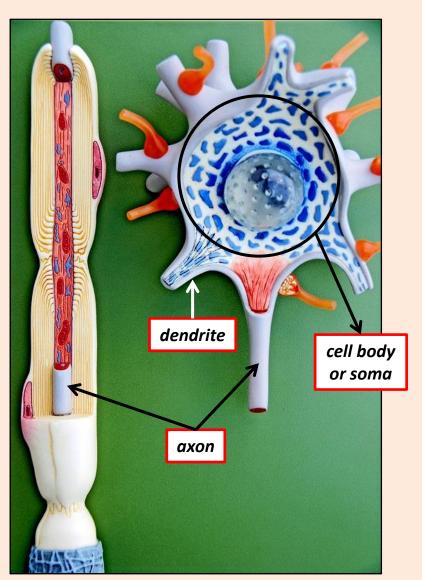
BIOL 2401 Unit 4 Lab Nervous Tissue & Nervous System Study Guide

Use this study guide to review nervous tissue & the structures of the nervous system, to include the neuron, brain, spinal cord, cranial nerves, & spinal nerves, for Lab Exam 4

Information in this study guide corresponds to multiple sections of the lab-exam review

<u>Neuron</u>

Anterior view & frontal section of neuron model shown



Dendrite

Functions to receive chemical information from surrounding neurons

Cell body (soma)

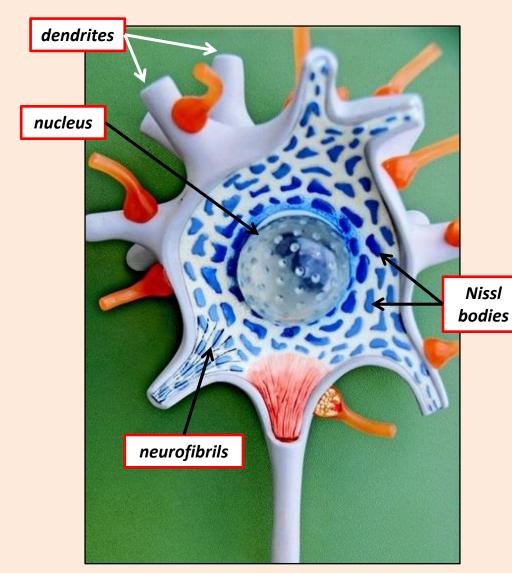
Functions to analyze/integrate information from dendrites

Axon

Functions to conduct/propagate
the action potential from the axon
hillock

Dendrites & Soma

Anterior view & frontal section of neuron model shown



Cell body (soma)

- **Golgi complex** (not shown on model)

 Functions to modify, package, store,
 and transport proteins in vesicles
- Nissl body
 Functions to synthesize proteins
- Neurofibril

Functions to provide cellular structure and movement of organelles and molecules

Nucleus

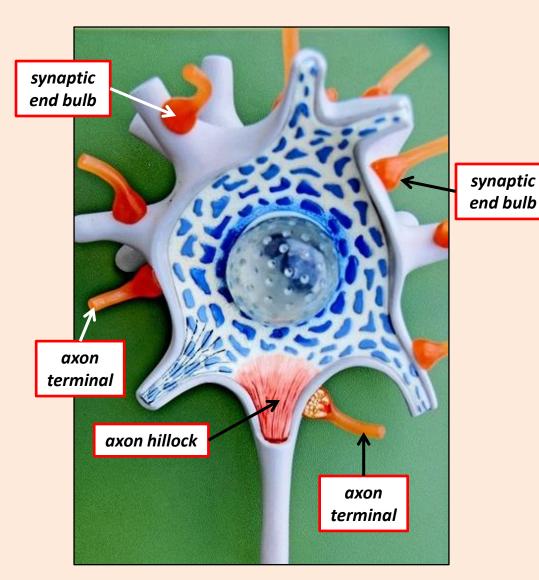
Functions to control/regulate protein synthesis

• **Nucleolus** (not shown on model)

Functions to synthesize ribosomes

<u>Axon</u>

Anterior view & frontal section of neuron model shown



Axon hillock

Functions to initiate the action potential

Axon terminal

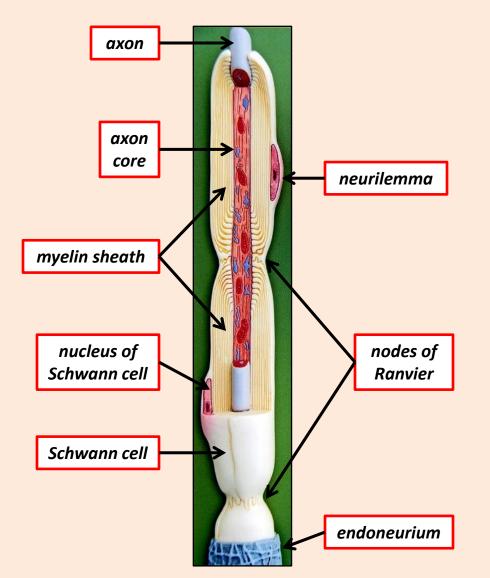
Functions to conduct/propagate the action potential to the synaptic end bulb

Synaptic end bulb

Functions to contain synaptic vesicles with neurotransmitters

<u>Axon</u>

Anterior view & frontal section of neuron model shown



Schwann cell

Functions to synthesize the myelin sheath that surrounds PNS neurons

Nucleus of Schwann cell

Functions to control/regulate protein synthesis

Myelin sheath

Functions to increase the speed of the action potential

Node of Ranvier

Functions to facilitate the conduction/propagation of the action potential along the length of the axon

Neurilemma

Functions to transport molecules/substances across its surface

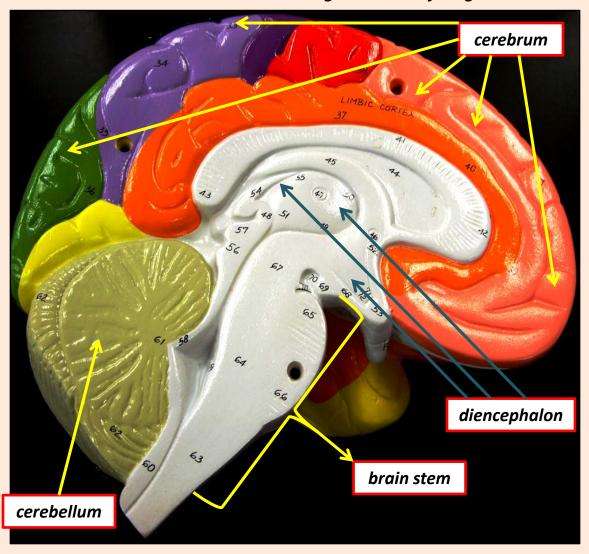
Endoneurium

Functions to cover/wrap around the axon, to include the Schwann cell and myelin sheath

Overview of the Brain

The brain is composed of the cerebrum, cerebellum, white matter tracts, diencephalon, & brain stem

Midsagittal view of large brain model shown



Brain

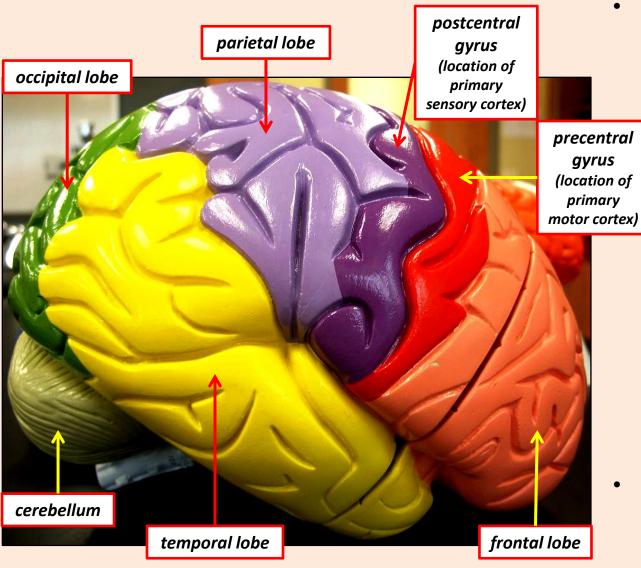
 Organ of the central nervous system (CNS)

Cerebrum

- Cerebrum divided into two cerebral hemispheres via the longitudinal fissure
- Composed of four lobes
 - Frontal lobe (1)
 - Parietal lobe (2)
 - Temporal lobe (1)
 - Occipital lobe (1)
- Cerebellum
- Diencephalon
- Brain stem

Cerebrum & Cerebellum

Lateral view of right side of large brain model shown

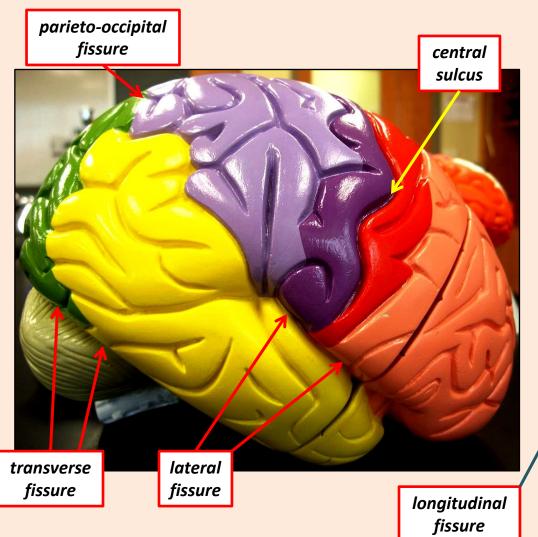


Cerebrum

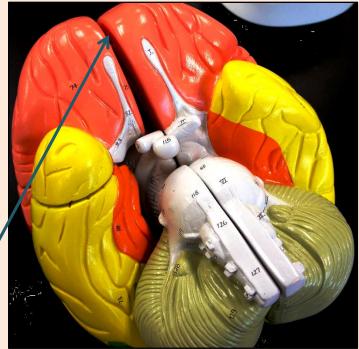
- Frontal lobe (1)
 - Composed of precentral gyrus (location of primary motor cortex)
 - Functions to control skeletal muscle contractions
- Parietal lobe (2)
 - Composed of postcentral gyrus (location of primary sensory cortex)
 - Functions to receive and integrate somatosensory information
- Temporal lobe (2)
 - Functions to receive & integrate auditory (sound), gustatory (taste), & olfactory (smell) information
- Occipital lobe (1)
 - Functions to receive & integrate visual information
- Cerebellum
 - Functions to coordinate skeletal muscle contractions

Fissures & Sulci

Lateral view of right side (left) & inferior view (right) of large brain model shown



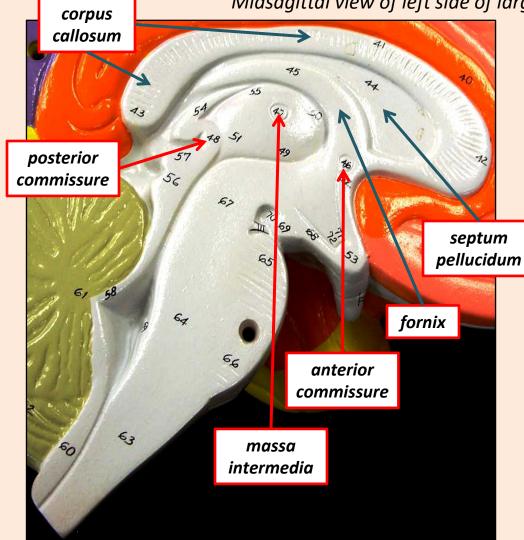
- Fissures (deep grooves)
 - Lateral fissure
 - Longitudinal fissure
 - Parieto-occipital fissure
 - Transverse fissure
- **Sulci** (shallow grooves)
 - Central sulcus



White Matter Tracts

White matter tracts include the corpus callasum, septum pellucidum, fornix, anterior commissure, massa intermedia, & posterior commissure

Midsagittal view of left side of large brain model shown



White matter tracts

 Bundles of myelinated axons that conduct/propagate nerve impulses to allow brain structures to communicate

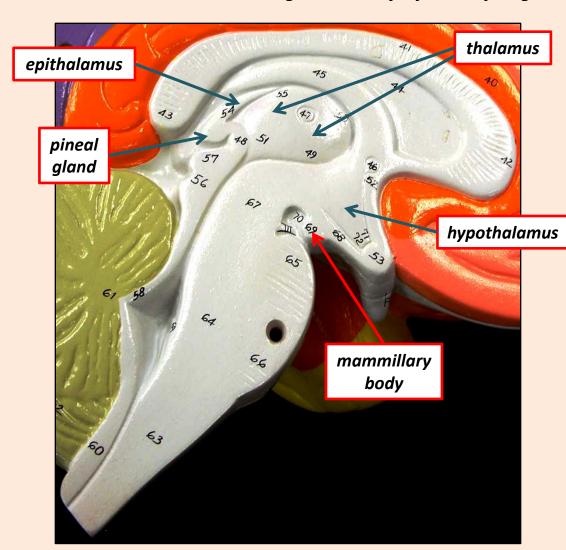
Corpus callosum

- Functions to allow the cerebral hemispheres to communicate
- Septum pellucidum
- Fornix
- Anterior commissure
- Massa intermedia (intermediate mass)
- Posterior commissure

Diencephalon

Diencephalon includes the thalamus, epithalamus, hypothalamus, & mammillary bodies

Midsagittal view of left side of large brain model shown



Thalamus

 Functions to relay/send most sensory nerve impulses from the brain stem to the cerebral cortex

Epithalamus

- Composed of the pineal gland
- Functions to induce sleep & active during emotional responses to olfaction

Hypothalamus

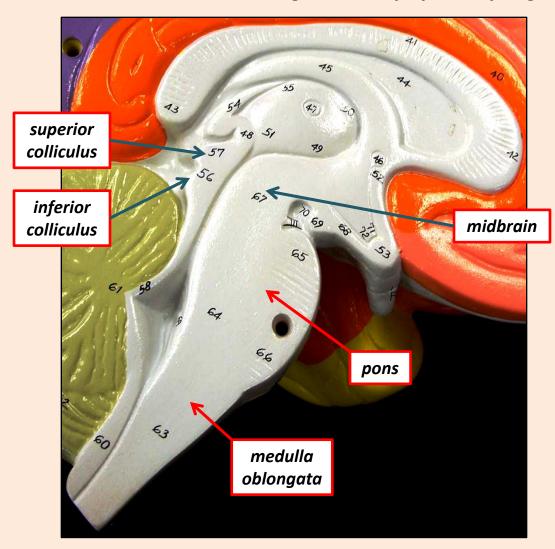
 Functions to regulate body temperature, food intake, water balance, and circadian rhythms, & controls glandular secretions

Mammillary body

Functions to relay/send
 olfactory nerve impulses to the
 cerebral cortex of the temporal
 lobe

Brain Stem

Brain stem includes the midbrain, pons, & medulla oblongata Midsagittal view of left side of large brain model shown



Midbrain

- Composed of the superior colliculi for visual reflexes & inferior colliculi for auditory reflexes
- Functions to relay/send nerve impulses between the cerebrum & spinal cord & coordinates skeletal muscle contractions

Pons

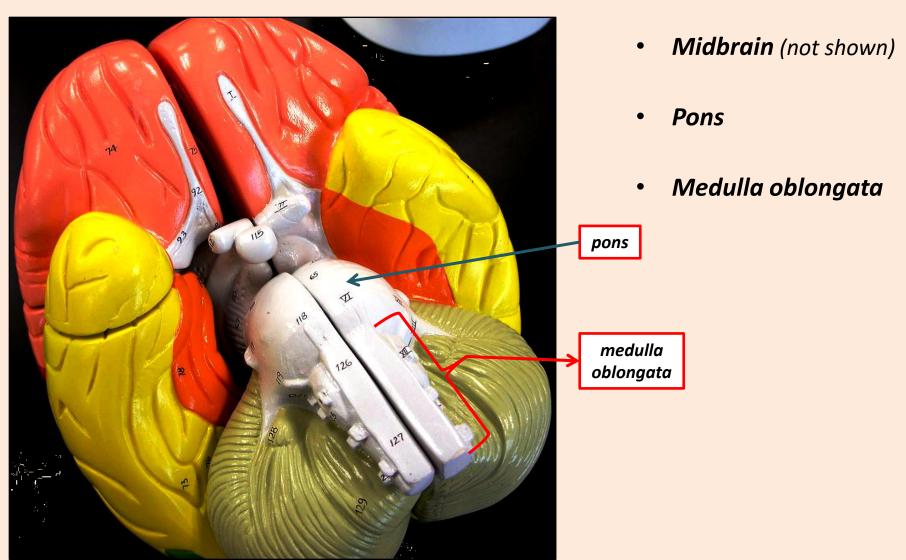
 Functions to relay/send nerve impulses about voluntary movements from cerebral cortex to cerebellum & maintains rhythmic breathing

Medulla oblongata

 Functions to regulate heart rate, blood pressure, breathing, & autonomic reflexes (i.e. sneezing, coughing, & vomiting)

Brain Stem

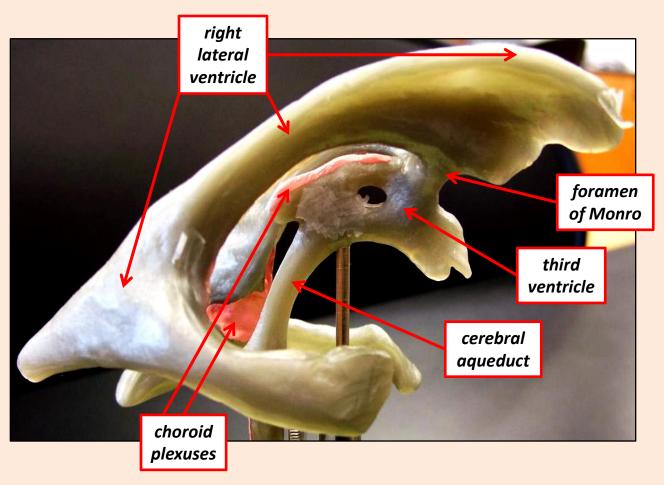
Inferior view of large brain model shown



Ventricles

Ventricles are cavities within the brain that contain cerebrospinal fluid (CSF)

Lateral view of right side of ventricles model shown

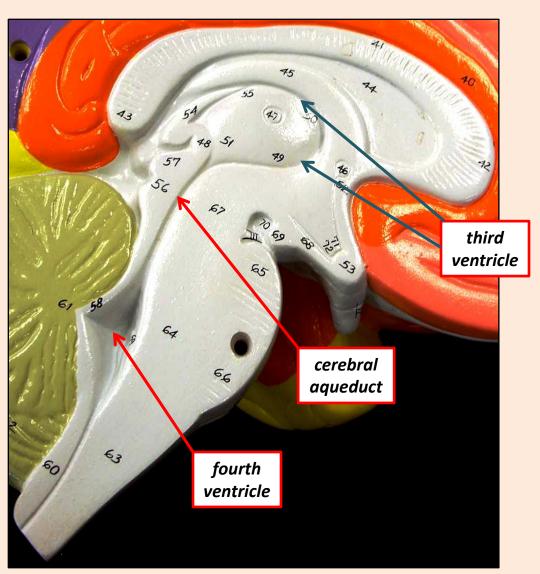


Lateral ventricles

- Two lateral ventricles
- Right lateral ventricle shown
- Left lateral ventricle not shown
- Foramen of Monro (interventricular foramen)
- Third ventricle
- Cerebral aqueduct
- Fourth ventricle (not shown)
- Choroid plexuses
 - Function to produce & secrete cerebrospinal fluid (CSF)

Ventricles

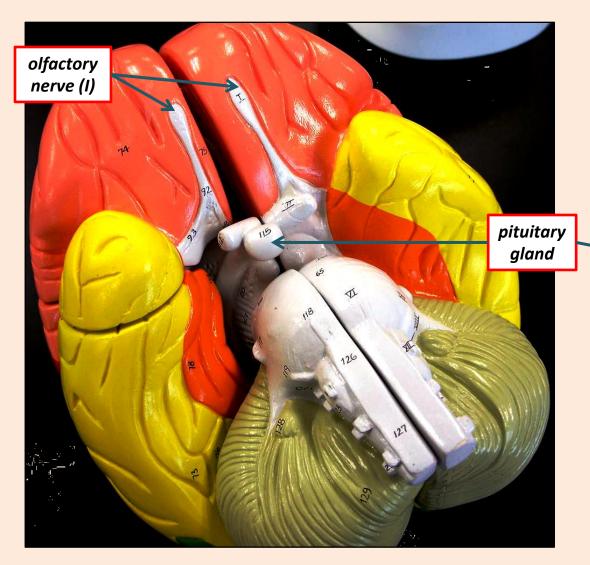
Midsagittal view of left side of large brain model shown



- Lateral ventricles (not shown)
- Third ventricle
- Cerebral aqueduct
- Fourth ventricle

Cranial Nerves & Pituitary Gland

Twelve pairs of cranial nerves compose the peripheral nervous system (PNS)
Inferior view of large brain model (left) & anterior view of brain stem model (right) shown



Pituitary gland

Functions to produce & secrete hormones

Olfactory nerve (I)

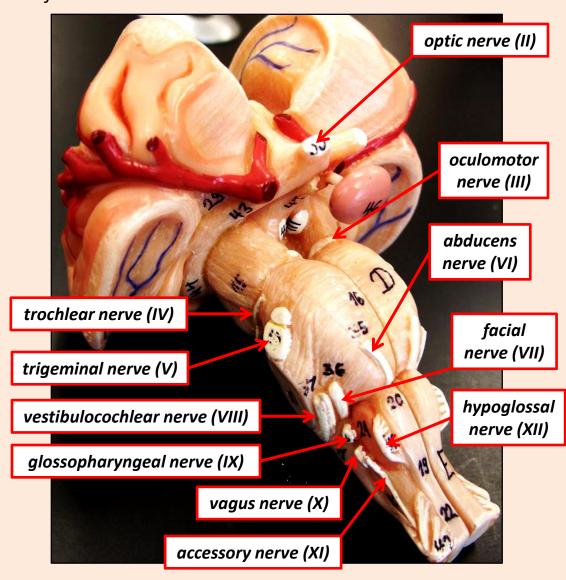
Functions as a sensory nerve



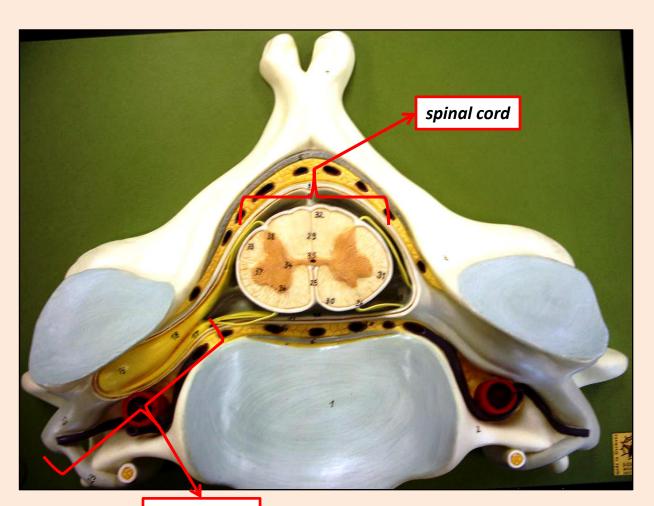
Cranial Nerves

Anterior view of brain stem model shown

- Optic nerve (II)
 - Functions as a sensory nerve
- Oculomotor nerve (III)
 - Functions as a motor nerve
- Trochlear nerve (IV)
 - Functions as a motor nerve
- Trigeminal nerve (V)
 - Functions as a mixed nerve
- Abducens nerve (VI)
 - Functions as a motor nerve
- Facial nerve (VII)
 - Functions as a mixed nerve
- Vestibulocochlear nerve (VIII)
 - Functions as a sensory nerve
- Glossopharyngeal nerve (IX)
 - Functions as a mixed nerve
- Vagus nerve (X)
 - Functions as a mixed nerve
- Accessory nerve (XI)
 - Functions as a motor nerve
- Hypoglossal nerve (XII)
 - Functions as a motor nerve



Superior view of spinal cord model shown



spinal nerve

Spinal cord

 Organ of the central nervous system (CNS)

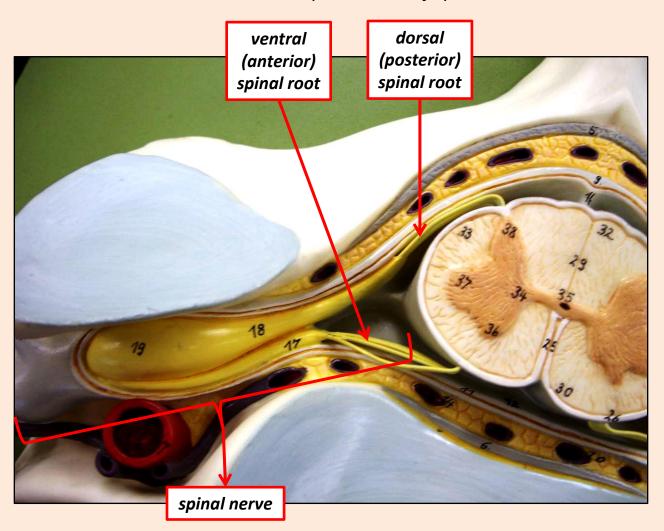
Spinal nerves

- Thirty-one pairs of spinal nerves branch from the spinal cord
- Each spinal nerve is

 a mixed nerve
 composed of sensory

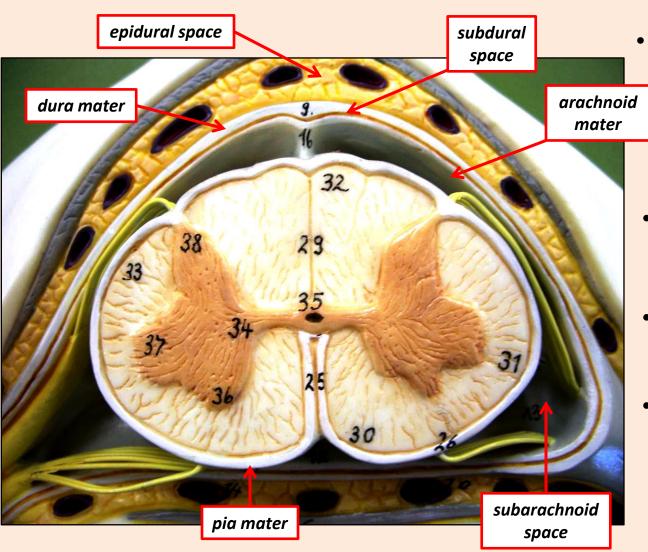
 & motor axons
- Function to receive sensory information from the periphery & conduct motor information to effectors

Superior view of spinal cord model shown



- Spinal nerve
- Dorsal (posterior) spinal root
 - Functions to
 conduct sensory
 nerve impulses
 from the periphery
 to the spinal cord
- Ventral (anterior) spinal root
 - Functions to
 conduct motor
 nerve impulses
 from the spinal
 cord to effectors

Meninges are membranes that cover & protect the brain & spinal cord Superior view of spinal cord model shown



Meninges

- Dura mater
- Arachnoid mater
- Pia mater

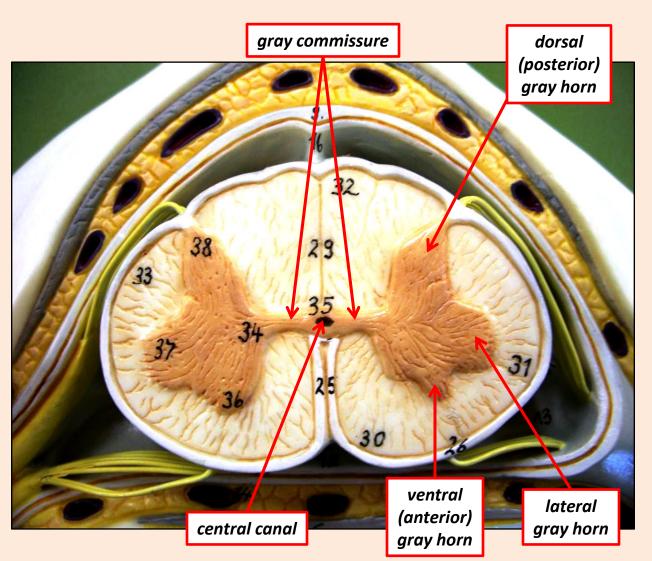
Epidural space

 Located above the dura mater

Subdural space

- Located below the dura mater
- Subarachnoid space
 - Located below the arachnoid mater

Gray matter is composed of neuronal cell bodies that integrate sensory information in the spinal cord
Superior view of spinal cord model shown

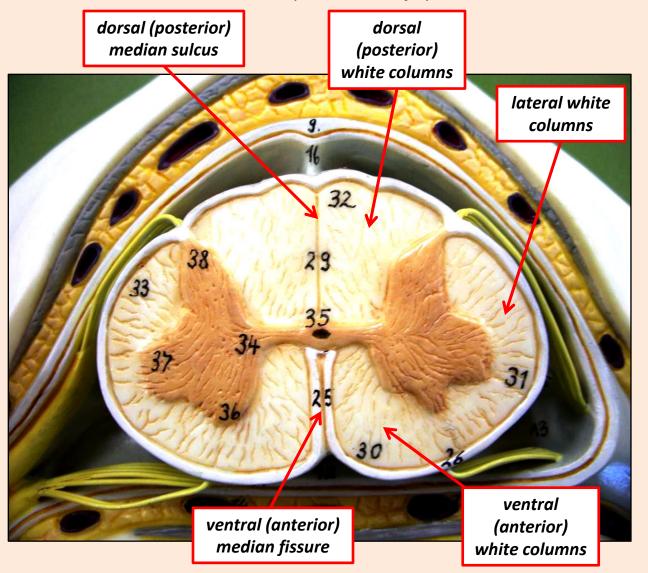


- Central canal
 - Functions to contain cerebrospinal fluid (CSF)
- Gray commissure

Gray matter:

- Dorsal (posterior) gray horns
- Lateral gray horns
- Ventral (anterior) gray horns

White matter is composed of myelinated axons that conduct nerve impulses to & from the brain Superior view of spinal cord model shown



- Dorsal (posterior)
 median sulcus
- Ventral (anterior)
 median fissure

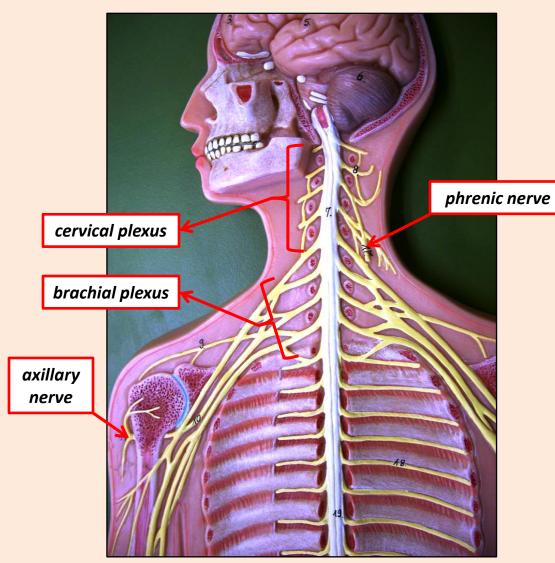
White matter:

- Dorsal (posterior)
 white columns
- Lateral white columns
- Ventral (anterior)
 white columns

Spinal Nerves

Thirty-one pairs of spinal nerves in the form plexuses compose the peripheral nervous system (PNS)

Anterior view of spinal nerves & plexuses shown



Cervical plexus

Phrenic nerve branchesfrom this plexus

Brachial plexus

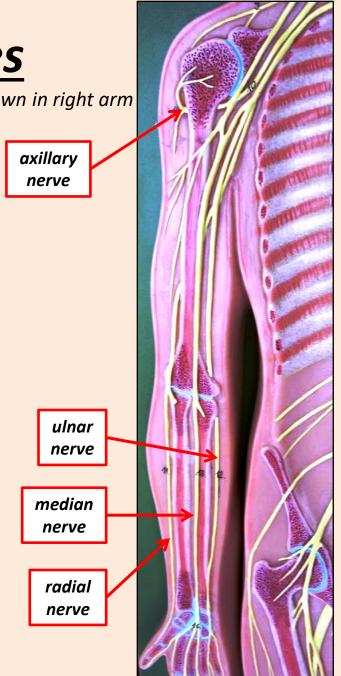
 Axillary nerve branches from this plexus

Spinal Nerves

Anterior view of spinal nerves & plexuses shown in right arm

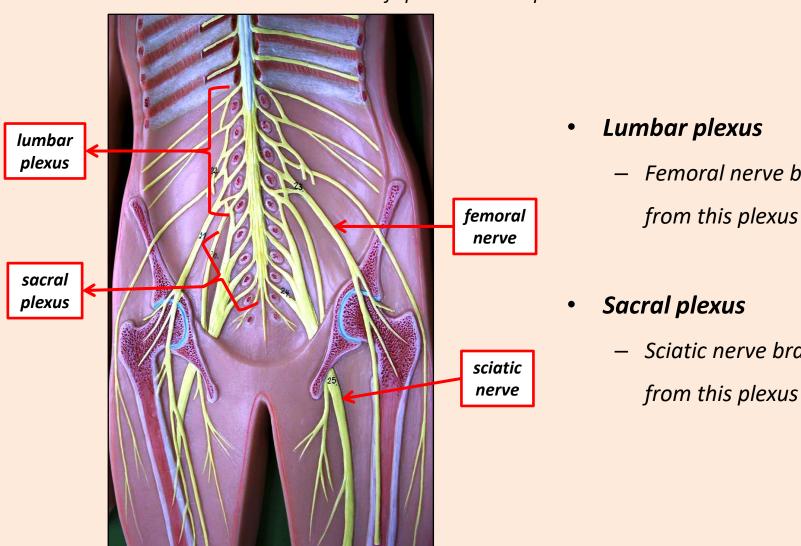
Brachial plexus

- Axillary nerve branches from this plexus
- Median nerve branches from this plexus
- Radial nerve branches from this plexus
- Ulnar nerve branches from this plexus



Spinal Nerves

Anterior view of spinal nerves & plexuses shown



Femoral nerve branches

Sciatic nerve branches from this plexus