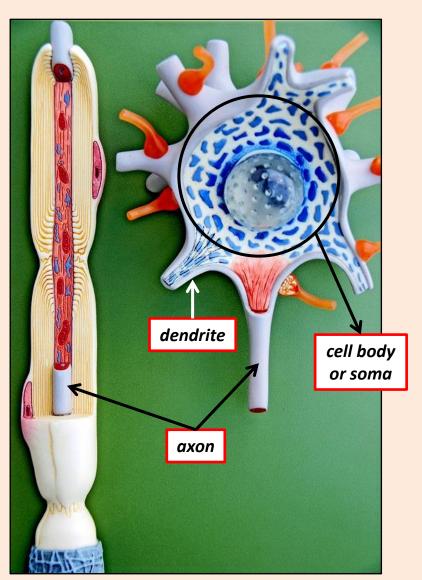
# BIOL 2401 Unit 4 Lab Nervous Tissue & Nervous System Study Guide

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)

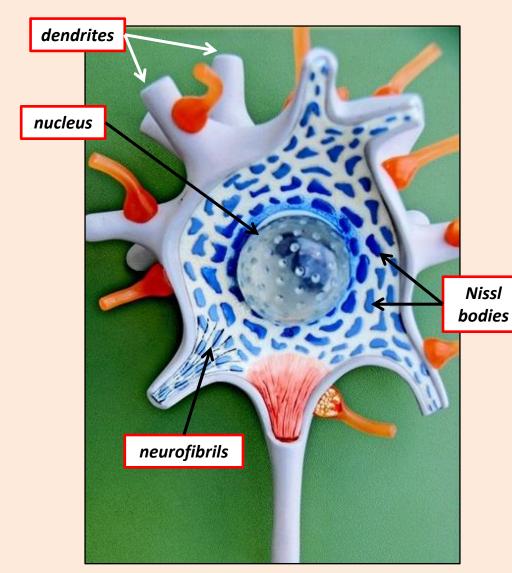
Functions to analyze/integrate information from dendrites

#### 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

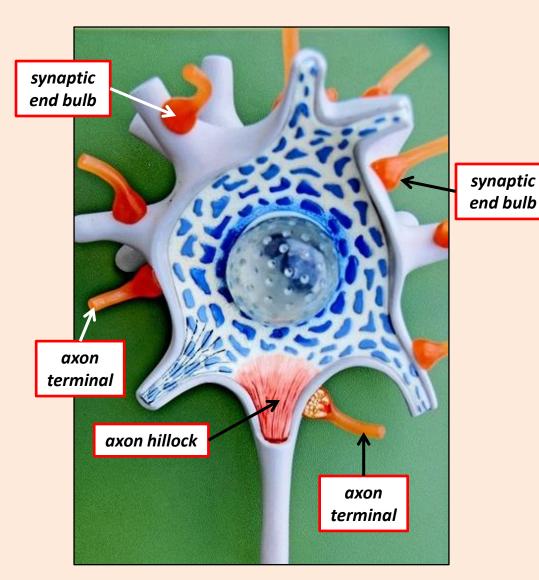
Functions to control/regulate protein synthesis

• **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

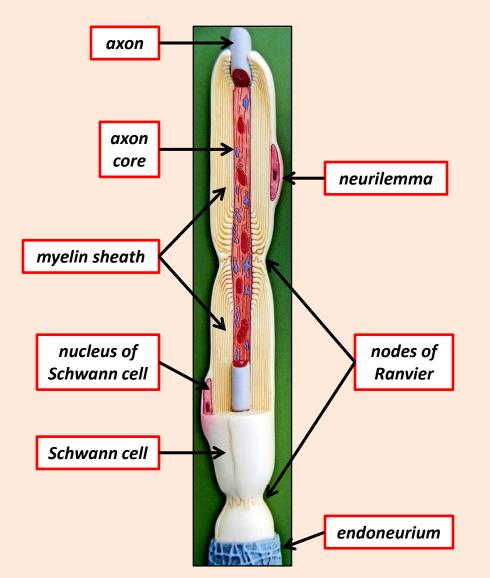
Functions to conduct/propagate the action potential to the synaptic end bulb

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

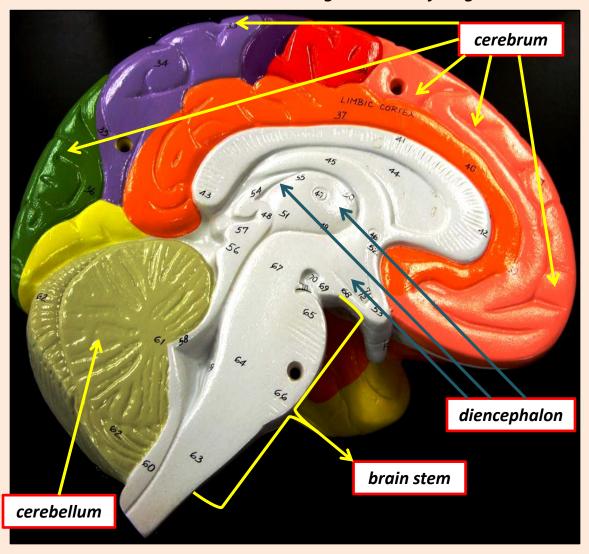
#### Endoneurium

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

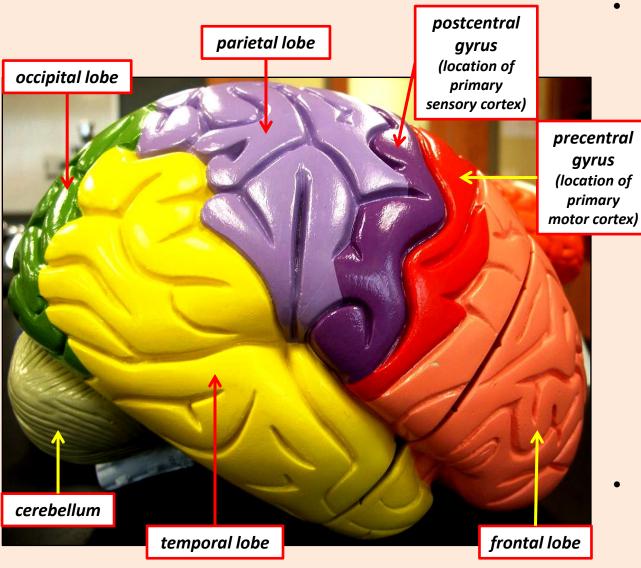
 Organ of the central nervous system (CNS)

#### 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

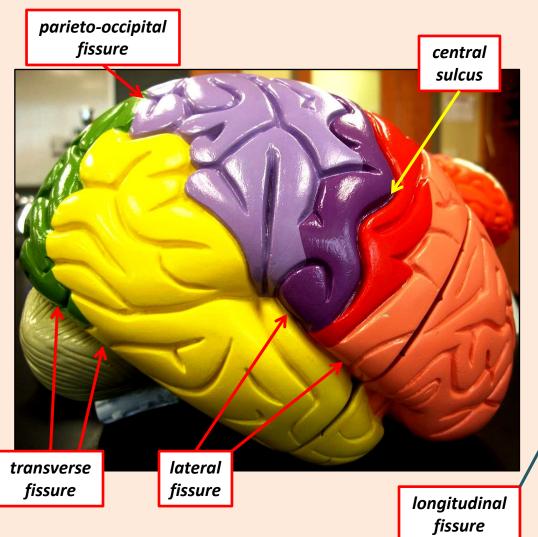


Cerebrum

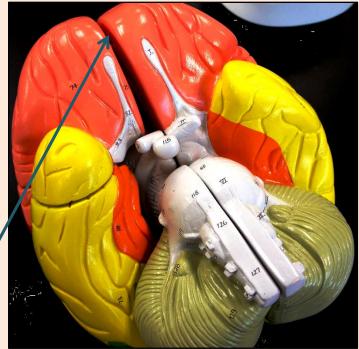
- Frontal lobe (1)
  - Composed of precentral gyrus (location of primary motor cortex)
  - Functions to control skeletal muscle contractions
- Parietal lobe (2)
  - Composed of postcentral gyrus (location of primary sensory cortex)
  - Functions to receive and integrate somatosensory information
- Temporal 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



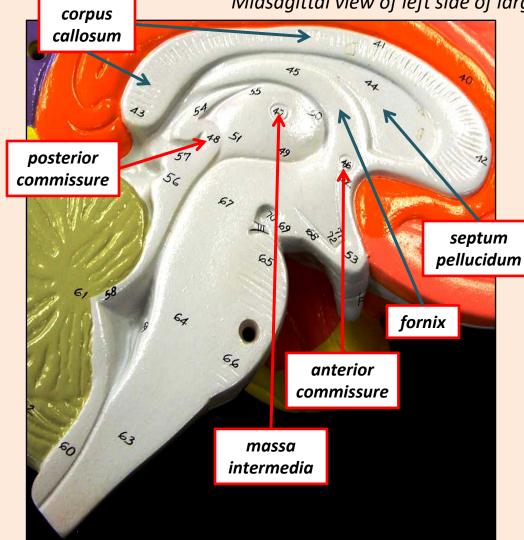
- Fissures (deep grooves)
  - Lateral fissure
  - Longitudinal fissure
  - Parieto-occipital fissure
  - Transverse fissure
- **Sulci** (shallow grooves)
  - Central sulcus



## 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

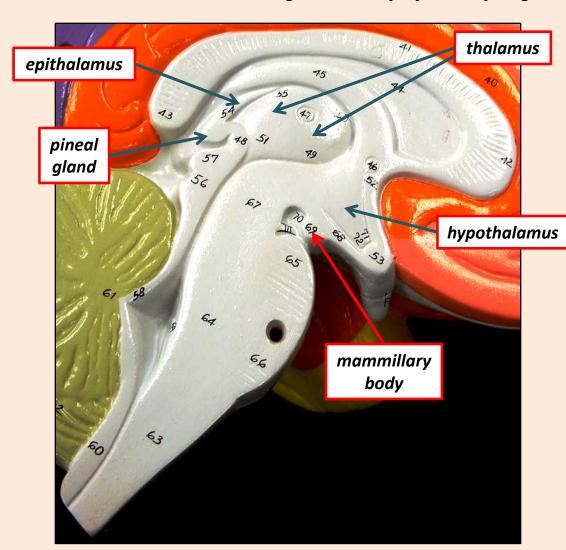
#### Corpus callosum

- 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

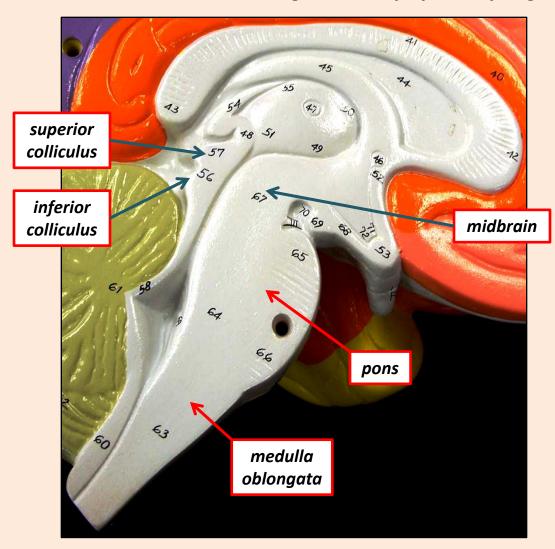
 Functions to regulate body temperature, food intake, water balance, and circadian rhythms, & controls glandular secretions

### 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

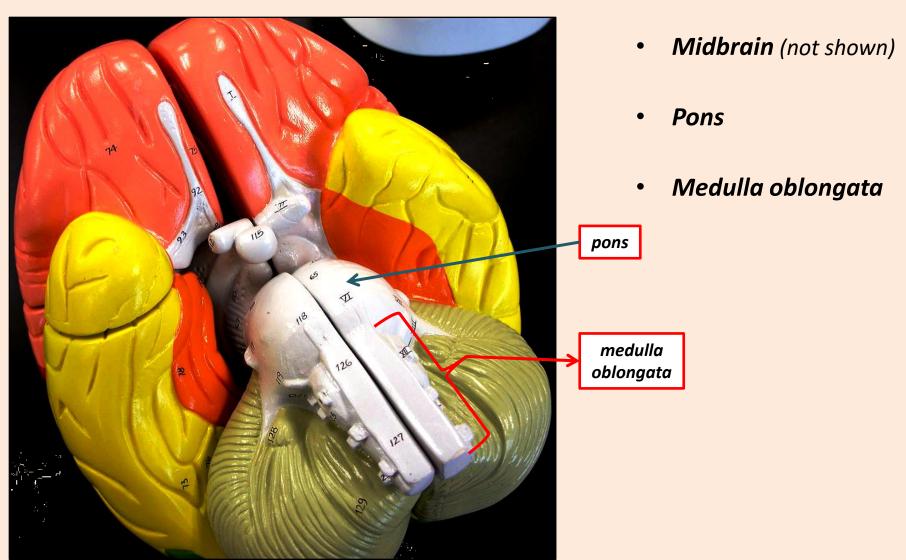
 Functions to relay/send nerve impulses about voluntary movements from cerebral cortex to cerebellum & maintains rhythmic breathing

#### Medulla oblongata

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

# **Brain Stem**

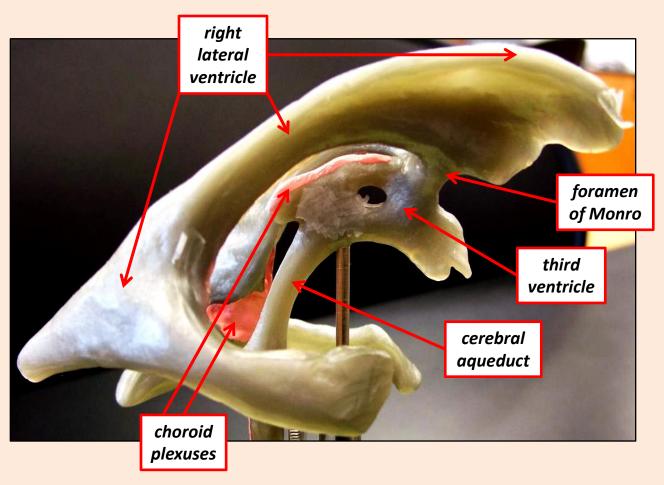
Inferior view of large brain model shown



# Ventricles

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

Lateral view of right side of ventricles model shown

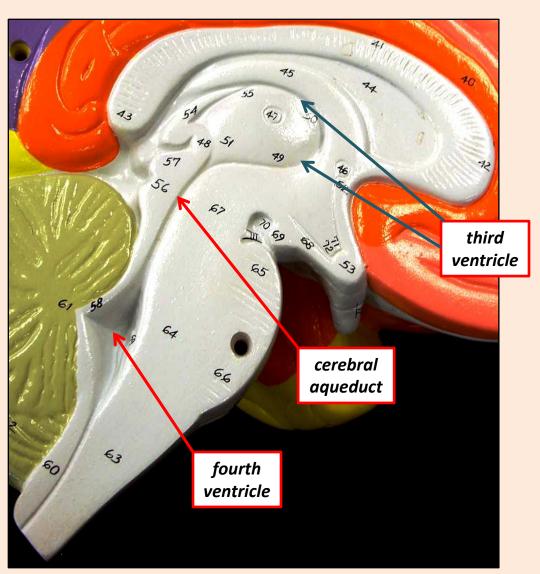


#### Lateral ventricles

- 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**

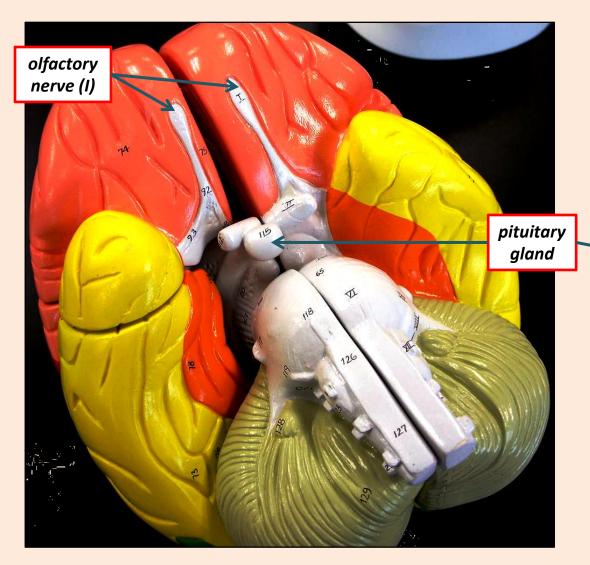
Midsagittal view of left side of large brain model shown



- 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)

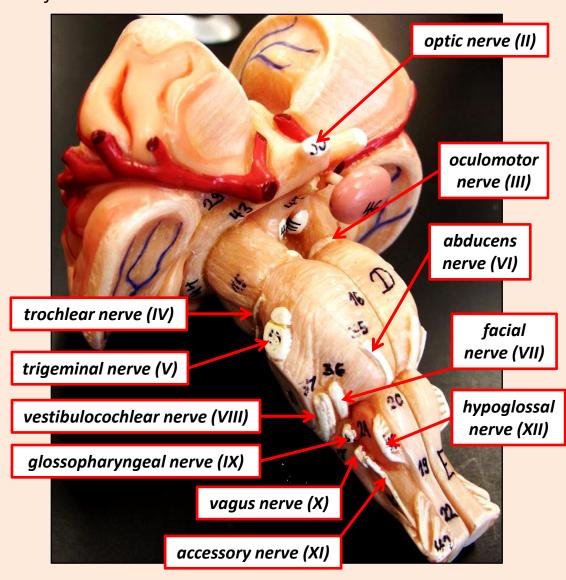
Functions as a sensory nerve



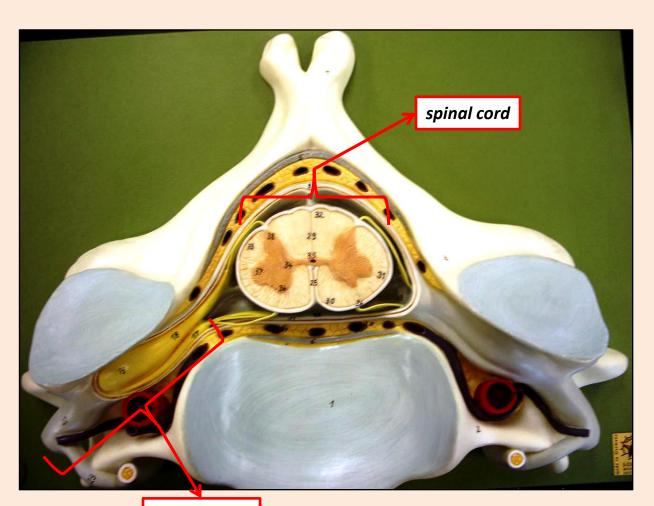
# **Cranial Nerves**

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)

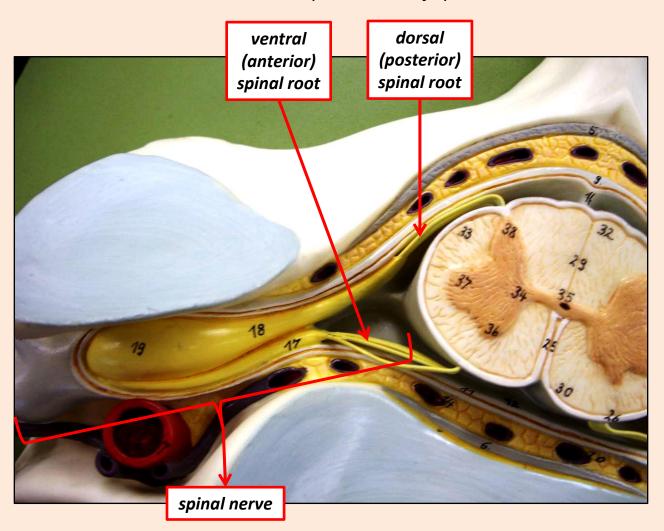
## Spinal nerves

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

   a mixed nerve
   composed of sensory

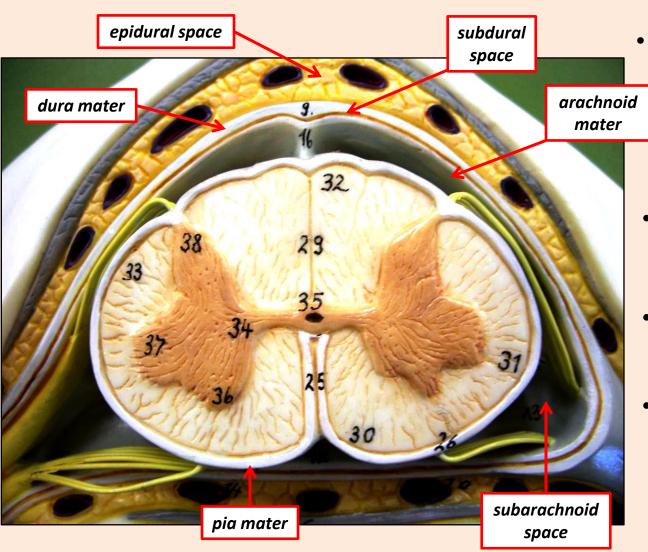
   & motor axons
- Function to receive sensory information from the periphery & conduct motor information to effectors

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

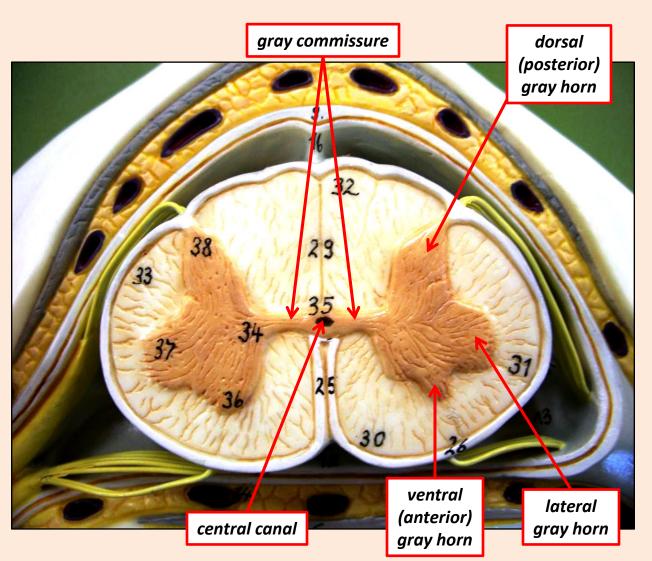
## Epidural space

 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

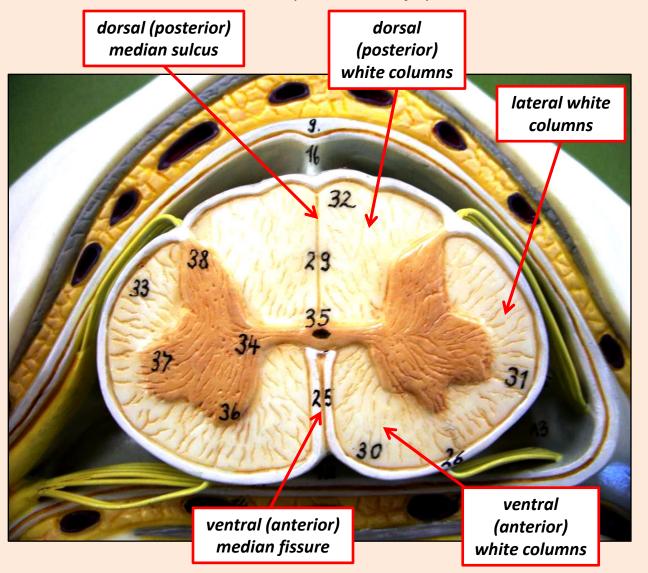


- Central canal
  - Functions to contain cerebrospinal fluid (CSF)
- Gray commissure

## **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

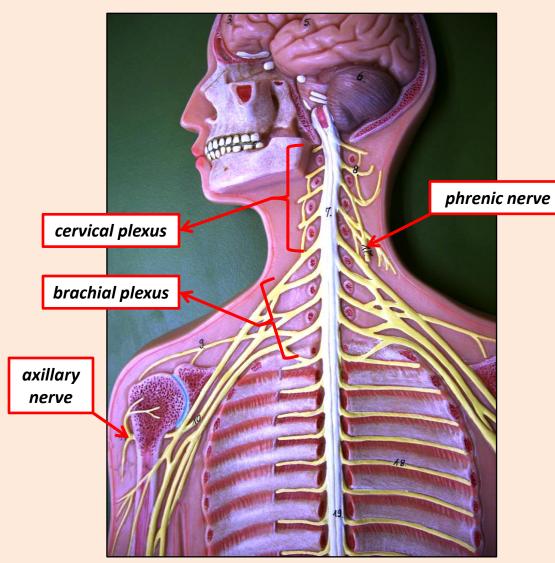
#### White matter:

- 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

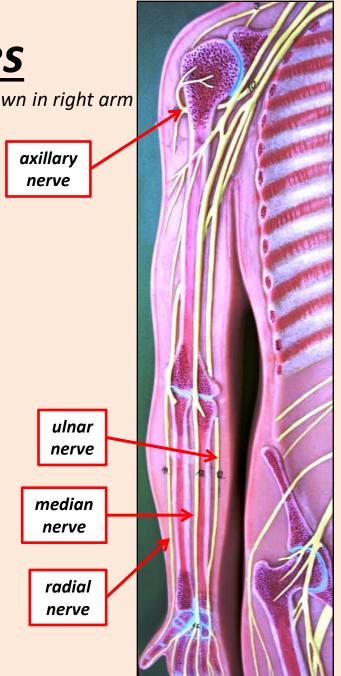
 Axillary nerve branches from this plexus

# **Spinal Nerves**

Anterior view of spinal nerves & plexuses shown in right arm

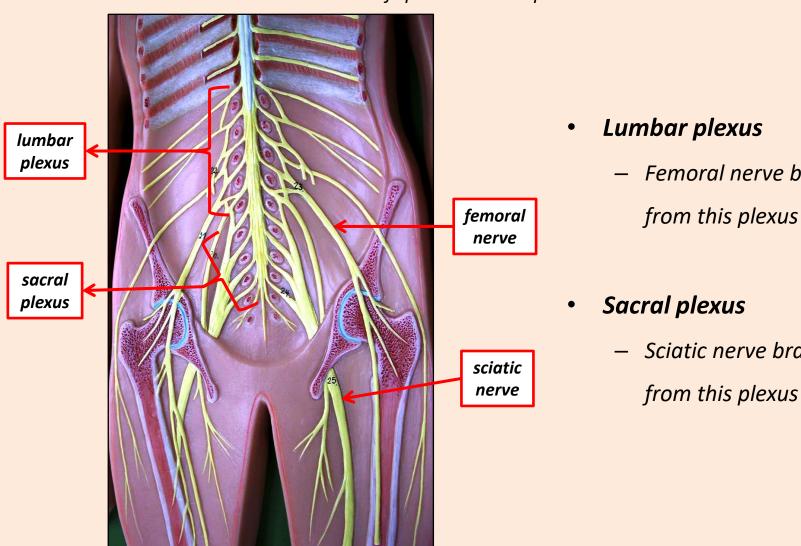
## Brachial plexus

- 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