

1. Divisions of the Nervous System

- 1) List the anatomical subdivisions.
- 2) List the functional subdivisions.

Central N.S.

Peripheral N.S.

Somatic N.S.

Autonomic N.S.

2. Nerve Tissue

- a. Write the terms that match the statements in the spaces at the right.

- 1) Process conducting impulses toward the cell body.
- 2) Process conducting impulses from the cell body.
- 3) Fatty insulation on some neuron processes.
- 4) Required for neuron process regeneration.
- 5) Neuron type carrying impulses toward the CNS.
- 6) Neuron type carrying impulses from the CNS.
- 7) Neuron type carrying impulses within the CNS.
- 8) Small spaces between Schwann cells.

Dendrite

Axon

Myelin

Neurilemma

Sensory neurons

Motor neurons

Interneurons

Nodes of Ranvier

- b. Write the names of the neuroglial cells that match the statements.

- 1) Line the ventricles of the brain.
- 2) Form myelin of neurons in the CNS.
- 3) Engulf bacteria and debris.
- 4) Form myelin of neurons in the PNS.
- 5) Bind neurons with blood vessels.

Ependymal cells

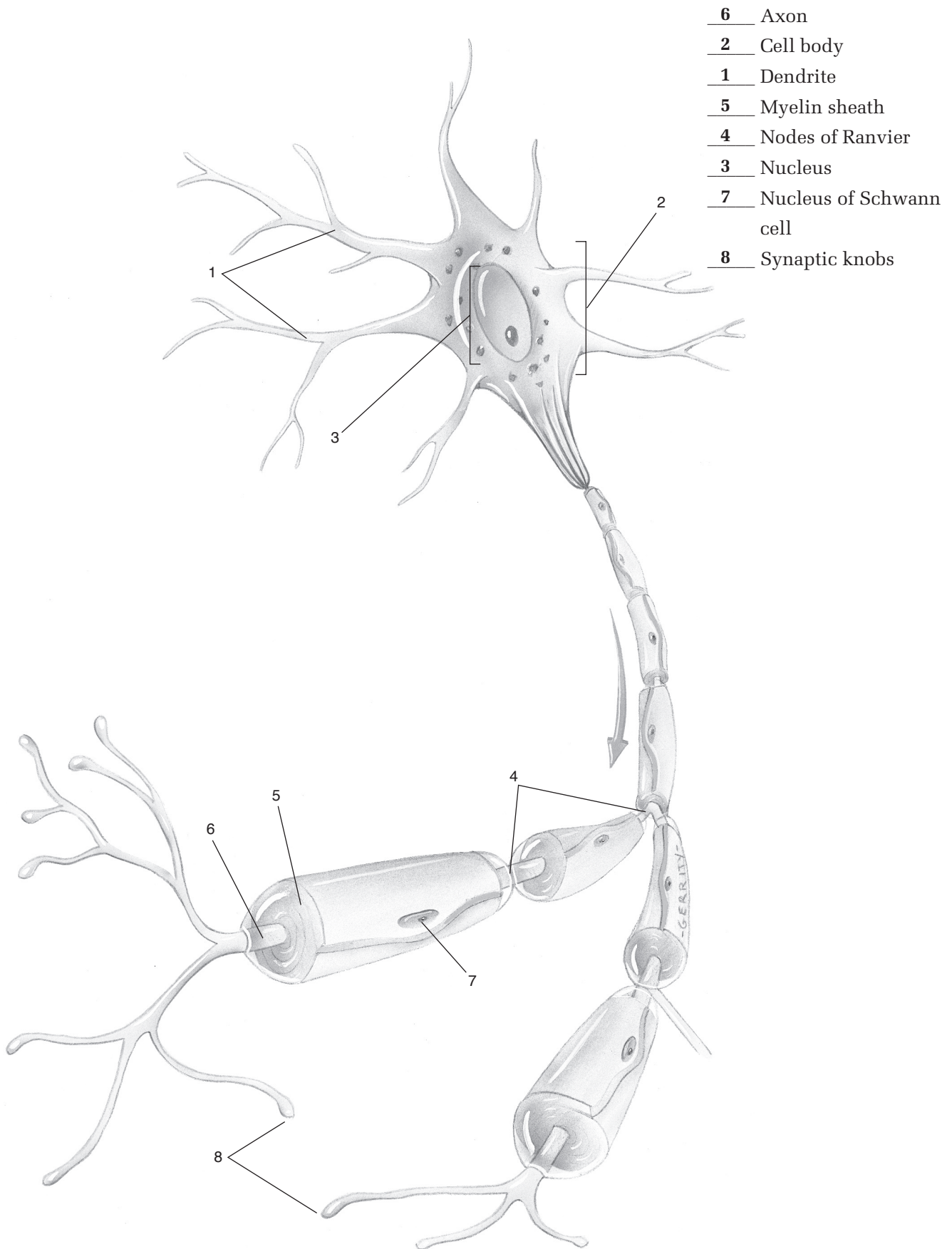
Oligodendrocytes

Microglial cells

Schwann cells

Astrocytes

- c. Label the figure by placing the number of the structure by the correct label. Draw arrows to show direction of impulse transport from dendrite tip to axon tip.



3. Neuron Physiology

- a. Write the terms that complete the sentences in the spaces at the right.

In a resting neuron, ____1____ ions are actively pumped out, which causes the membrane to be ____2____ with an excess of positive ions ____3____ the membrane and an excess of negative ions ____4____ the neuron. A threshold stimulus makes the membrane permeable to ____5____ ions that rapidly diffuse into the neuron, which depolarizes the membrane forming a nerve ____6____. An impulse is conducted as a ____7____ wave passes along a neuron. A depolarized membrane is repolarized when ____8____ ions diffuse out of the neuron and replace the ____9____ ions that entered the neuron. Impulse conduction is more rapid in ____10____ nerve fibers.

In synaptic transmission, an impulse reaching a synaptic knob causes the release of a ____11____ into the ____12____. The ____13____ binds with ____14____ on the postsynaptic neuron, causing an ____15____ to be formed. An enzyme quickly breaks down the ____16____ and restores the synapse to its resting state.

- b. Indicate the excitatory (+) and inhibitory (–) transmitters.

<u>+</u> Acetylcholine	<u>–</u> Dopamine
<u>–</u> GABA	<u>+</u> Norepinephrine

- c. If a drug prevents an excitatory neurotransmitter from binding to receptors of the postsynaptic neuron, will synaptic transmission occur? No How might such a drug be useful in a clinical situation?
Such a drug would be useful when it is desirable to prevent or reduce the transmission of impulses, such as reducing pain by preventing impulses from reaching the brain. Such a drug would be useful in treating a neural disorder caused by an excessive secretion of a specific neurotransmitter.

- 1) Sodium
- 2) Polarized
- 3) Outside
- 4) Inside
- 5) Sodium
- 6) Impulse
- 7) Depolarization
- 8) Potassium
- 9) Sodium
- 10) Myelinated
- 11) Neurotransmitter
- 12) Synaptic cleft
- 13) Neurotransmitter
- 14) Receptors
- 15) Impulse
- 16) Neurotransmitter

4. Protection for the Central Nervous System

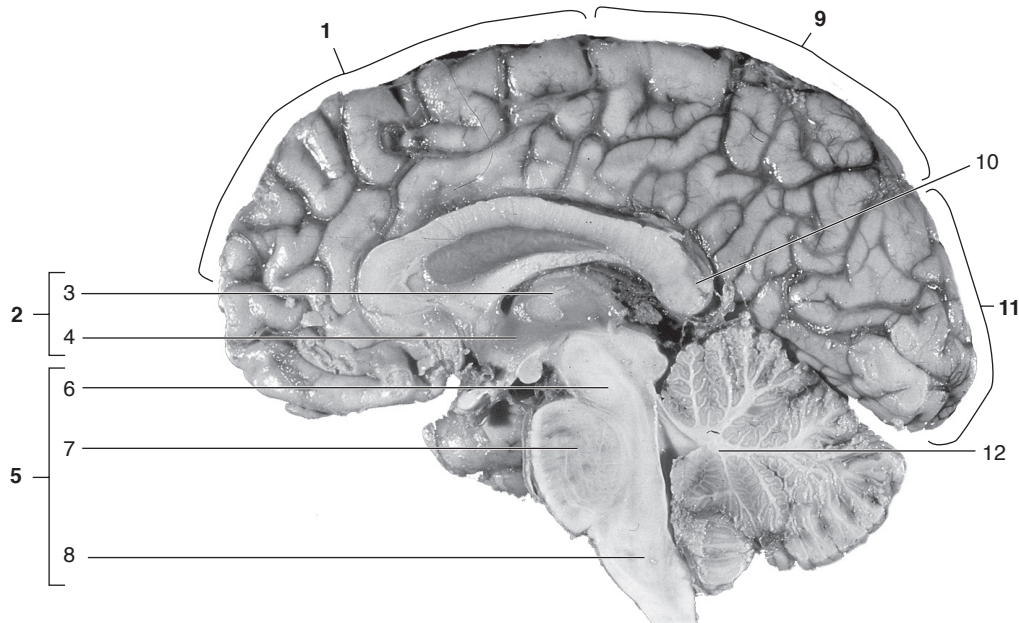
Write the terms that match the phrases in the spaces at the right.

- 1) Outermost membrane of meninges.
- 2) Intermediate membrane of meninges.
- 3) Innermost membrane of meninges.
- 4) Portion of skull protecting brain.
- 5) Meningeal space with cerebrospinal fluid.
- 6) Space filled with fatty connective tissue in vertebral canal.
- 7) Provides bony protection for spinal cord.

- | |
|---------------------------|
| <u>Dura mater</u> |
| <u>Arachnoid mater</u> |
| <u>Pia mater</u> |
| <u>Cranium</u> |
| <u>Subarachnoid space</u> |
| <u>Epidural space</u> |
| <u>Vertebrae</u> |

5. The Brain

- a. Label the figure by placing the number of the structure by the correct label.



- | | |
|------------------------------------|----------------------------|
| <u>5</u> Brain stem | <u>2</u> Diencephalon |
| <u>12</u> Cerebellum | <u>4</u> Hypothalamus |
| <u>1</u> Cerebrum, frontal lobe | <u>8</u> Medulla oblongata |
| <u>11</u> Cerebrum, occipital lobe | <u>6</u> Midbrain |
| <u>9</u> Cerebrum, parietal lobe | <u>7</u> Pons |
| <u>10</u> Corpus callosum | <u>3</u> Thalamus |

- b. Write the names of the structures that match the phrases.

- 1) Connects the cerebral hemispheres.
- 2) Surface layer of cerebral gray matter.
- 3) Ridges on cerebral surface.
- 4) Shallow grooves on cerebral surface.
- 5) Groove separating cerebral hemispheres.
- 6) Cerebral lobe anterior to central sulcus.
- 7) Cerebral lobe posterior to central sulcus.
- 8) Most posterior cerebral lobe.
- 9) Cerebral lobe inferior to lateral sulcus.
- 10) Portion of the brain that is continuous with the spinal cord.
- 11) Two lateral masses of gray matter connected by the intermediate mass.
- 12) Forms the floor of third ventricle.
- 13) Formed of pons, midbrain, and medulla.
- 14) Lowest portion of the brain.

- | |
|-----------------------------|
| <u>Corpus callosum</u> |
| <u>Cerebral cortex</u> |
| <u>Gyri</u> |
| <u>Sulci</u> |
| <u>Longitudinal fissure</u> |
| <u>Frontal</u> |
| <u>Parietal</u> |
| <u>Occipital</u> |
| <u>Temporal</u> |
|
 |
| <u>Medulla oblongata</u> |
|
 |
| <u>Thalamus</u> |
| <u>Hypothalamus</u> |
| <u>Brain stem</u> |
| <u>Medulla oblongata</u> |

- | | |
|---|---------------------------|
| 15) Superior portion of brain stem. | <u>Midbrain</u> |
| 16) Consists of two lateral hemispheres separated by the vermis. | <u>Cerebellum</u> |
| 17) Cavities in the cerebral hemispheres. | <u>Lateral ventricles</u> |
| 18) Cavity continuous with the central canal of the spinal cord. | <u>4th ventricle</u> |
| 19) Cavity between lateral masses of the thalamus and above the hypothalamus. | <u>3rd ventricle</u> |
| 20) Second largest portion of the brain. | <u>Cerebellum</u> |
- c. Match the parts of the brain with the functions described.
- | | | |
|-----------------|----------------------|------------------------|
| 1) Cerebrum | 4) Medulla oblongata | 7) Pons |
| 2) Cerebellum | 5) Limbic system | 8) Reticular formation |
| 3) Hypothalamus | 6) Midbrain | 9) Thalamus |
- 3 Controls body temperature and water balance.
- 2 Coordinates body movements, posture, and equilibrium.
- 1, 5 Controls moods and emotional behavior.
- 1 Controls voluntary actions, will, and intellect.
- 9 Provides general, nonspecific awareness of sensations.
- 1 Provides specific interpretation of sensations.
- 8 Controls wakefulness and arouses cerebrum.
- 3, 4 Controls heart rate and blood pressure.
- 7 Assists medulla oblongata in control of breathing.
- 3 Major center controlling homeostasis.
- d. Match parts of the cerebrum with the functions described.
- | | |
|----------------------|----------------------|
| 1) Association areas | 6) Precentral gyrus |
| 2) Broca's area | 7) Premotor area |
| 3) Corpus callosum | 8) Postcentral gyrus |
| 4) Left hemisphere | 9) Temporal lobe |
| 5) Occipital lobe | 10) Right hemisphere |
- 8 Interprets sensations from the skin.
- 5 Center for visual sensations.
- 9 Center for sound sensations.
- 2 Controls ability to speak.
- 6 Primary control area for contractions of skeletal muscles.
- 4 Hemisphere controlling verbal and computational skills in most people.
- 10 Hemisphere controlling artistic and spatial skills in most people.
- 3 Conducts impulses between cerebral hemispheres.
- 7 Controls complex and sequential learned motor activities.
- 1 Controls will, memory, and intellectual processes.

- e. Write the terms that complete the sentences in the spaces at the right.

Cerebrospinal fluid (CSF) is produced by a ____1____ in each ventricle. Most of the CSF is formed within the ____2____ ventricles and flows through two small openings into the median ____3____ ventricle. From here, it passes into the fourth ventricle in the posterior portion of the brain stem. From the ____4____ ventricle, some CSF flows into the ____5____ of the spinal cord, but most of it enters the ____6____ space and flows around the spinal cord and brain. CSF is absorbed into the blood of the ____7____ located in the ____8____ above the longitudinal fissure of the cerebrum.

- 1) Choroid plexus
- 2) Lateral
- 3) Third
- 4) Fourth
- 5) Central canal
- 6) Subarachnoid
- 7) Dural sinus
- 8) Dura mater

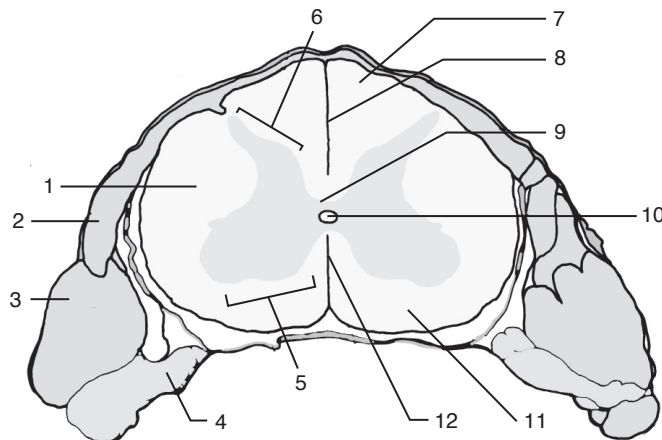
6. The Spinal Cord

- a. Write the terms that match the phrases in the spaces at the right.

- 1) Contain cell bodies of motor neurons.
- 2) Composed of myelinated nerve fibers.
- 3) Contain cell bodies of interneurons.
- 4) Carry impulses toward brain.
- 5) Carry impulses from brain.
- 6) Vertebra where spinal cord ends.
- 7) Part of brain continuous with spinal cord.
- 8) Nerves arising from spinal cord.

- Anterior horns
- Nerve tracts
- Posterior horns
- Ascending tracts
- Descending tracts
- 2nd lumbar
- Medulla oblongata
- Spinal nerves

- b. Label the figure by placing the number of the structure in the space by the correct label.



- | | |
|--------------------------------------|--|
| <u>12</u> Anterior median fissure | <u>4</u> Spinal nerve, anterior (ventral) root |
| <u>10</u> Central canal | <u>2</u> Spinal nerve, posterior (dorsal) root |
| <u>9</u> Gray matter, commissure | <u>3</u> Spinal nerve, posterior root ganglion |
| <u>5</u> Gray matter, anterior horn | <u>11</u> White matter, anterior column |
| <u>6</u> Gray matter, posterior horn | <u>1</u> White matter, lateral column |
| <u>8</u> Posterior median fissure | <u>7</u> White matter, posterior column |

c. Write the terms that match the phrases in the spaces at the right.

- | | |
|--|-------------------------------------|
| 1) Tissue binding nerve fibers together in a nerve. | 1) <u>Fibrous connective tissue</u> |
| 2) Nerves arising from the spinal cord. | 2) <u>Spinal nerves</u> |
| 3) Nerves arising from the brain. | 3) <u>Cranial nerves</u> |
| 4) Nerves composed of both axons and dendrites. | 4) <u>Mixed nerves</u> |
| 5) Sensory neuron processes in spinal nerves. | 5) <u>Dendrites</u> |
| 6) Neurons carrying impulses from the CNS. | 6) <u>Motor neurons</u> |
| 7) Neurons carrying impulses to the CNS. | 7) <u>Sensory neurons</u> |
| 8) Nerves composed of both sensory and motor neuron processes. | 8) <u>Mixed nerves</u> |

7. The Peripheral Nervous System

a. Write the numerals and names of the cranial nerves described by the phrases.

- | | |
|--|-------------------------------|
| 1) Transmits motor impulses to facial muscles. | <u>VII Facial</u> |
| 2) Transmits sensory impulses from retina. | <u>II Optical</u> |
| 3) Transmits motor impulses to muscles that move the eyes (three nerves). | <u>III Oculomotor</u> |
| | <u>IV Trochlear</u> |
| | <u>VI Abducens</u> |
| 4) Transmits sensory impulses from thoracic and abdominal viscera. | <u>X Vagus</u> |
| 5) Transmits motor impulses to tongue muscles. | <u>XII Hypoglossal</u> |
| 6) Transmits sensory impulses from the ear. | <u>VIII Vestibulocochlear</u> |
| 7) Transmits sensory impulses from “smell” receptors. | <u>I Olfactory</u> |
| 8) Transmits motor impulses to chewing muscles. | <u>V Trigeminal</u> |
| 9) Transmits sensory impulses from the face. | <u>V Trigeminal</u> |
| 10) Transmits motor impulses to muscles of the larynx and to the trapezius muscle. | <u>XI Accessory</u> |
| 11) Transmits motor impulses to salivary glands. | <u>IX Glossopharyngeal</u> |
| 12) Transmits motor impulses to thoracic and abdominal viscera. | <u>X Vagus</u> |
| 13) Transmits sensory impulses from the teeth. | <u>V Trigeminal</u> |
| 14) Transmits motor impulses to the eye that adjust pupil size and lens shape. | <u>III Oculomotor</u> |

b. Write the terms that match the phrases in the spaces at the right.

- | | |
|---|-----------------------|
| 1) Number of pairs of spinal nerves. | <u>31</u> |
| 2) Root containing axons of motor nerves. | <u>Anterior</u> |
| 3) Root containing sensory neurons. | <u>Posterior</u> |
| 4) Spinal nerves that do <i>not</i> form plexuses. | <u>Thoracic</u> |
| 5) Plexuses from which nerves to the legs emerge. | <u>Lumbar, sacral</u> |
| 6) Rapid, involuntary, predictable responses. | <u>Reflexes</u> |
| 7) Where spinal nerve fibers are sorted and recombined. | <u>Plexuses</u> |

- c. Write the terms that complete the sentences in the spaces at the right.

In a somatic spinal reflex, a painful stimulus causes a receptor to form impulses that are carried by a ____1____ neuron to the spinal cord. This neuron enters the spinal cord via the ____2____ root and synapses with an ____3____ in the ____4____ horn. This second neuron extends to the ____5____ horn, where it synapses with a ____6____ neuron that exits the spinal cord via the ____7____ root and carries impulses to an ____8____.

- 1) Sensory
- 2) Posterior
- 3) Interneuron
- 4) Posterior
- 5) Anterior
- 6) Motor
- 7) Anterior
- 8) Effector

8. The Autonomic Nervous System

- a. Write the terms that match the phrases in the spaces at the right.

- 1) Division arising from brain stem and sacral region of spinal cord.
- 2) Division arising from thorax and lumbar regions of spinal cord.
- 3) Autonomic ganglia forming a chain on each side of the vertebral column.
- 4) Neurotransmitter secreted by postganglionic sympathetic neurons.
- 5) Neurotransmitter secreted by postganglionic parasympathetic neurons.
- 6) Division preparing body for emergencies.
- 7) Division promoting digestion.
- 8) Division increasing blood pressure.

Parasympathetic

Sympathetic

Sympathetic chain ganglia

Norepinephrine

Acetylcholine

Sympathetic

Parasympathetic

Sympathetic

- b. Write the terms that complete the sentences in the spaces at the right.

In a spinal autonomic visceral reflex, a ____1____ neuron exits the spinal cord via an ____2____ root and extends to an autonomic ____3____, where it synapses with a ____4____ neuron that continues to an effector.

- 1) Preganglionic
- 2) Anterior
- 3) Ganglion
- 4) Postganglionic

9. Disorders of the Nervous System

Write the disorders described by the phrases.

- 1) Infection of the meninges.
- 2) Caused by a deficiency of dopamine.
- 3) Severe memory loss caused by a loss of certain cholinergic neurons in the brain.
- 4) Blood clot, aneurysm, or hemorrhage in brain.
- 5) Destruction of myelin sheath in CNS.

Meningitis

Parkinson's disease

Alzheimer's disease

Cerebrovascular accident

Multiple sclerosis

- 6) Prenatal brain damage, often by viral infections like German measles.
- 7) Convulsive seizures.
- 8) A severe jarring of the brain.
- 9) Neuritis by reactivation of chickenpox virus.
- 10) Results from inactive reticular formation.

Cerebral palsy

Epilepsy

Concussion

Shingles

Coma

10. Clinical Applications



- a. A stroke patient is paralyzed on the right side of the body and cannot speak. What part of the brain is affected by the stroke? Broca's area and the precentral gyrus of the left frontal lobe of the cerebrum.

- b. A patient complains of severe pain in the left lower back that extends down the thigh. A nurse describes the pain as neuralgia. What is neuralgia? Pain arising from a nerve.

What nerve is the likely source of the pain? Vertebral pressure on the sciatic nerve.

- c. The poliomyelitis virus destroys neuron cell bodies in the anterior horn of the spinal cord. If the spinal nerve affected innervates the left leg, what will be the effect on the patient? Paralysis

Will the patient fully recover? No Explain. If the neuron cell bodies are destroyed, the neurons die, and recovery is not possible.