

Chapter 12: Spinal Cord and Spinal Nerves

I. Spinal Cord

A. General Structure

1. The spinal cord extends from the _____ to the _____
2. Why is the spinal cord shorter than the vertebral column? _____

3. The spinal cord gives rise to _____
 - a. Spinal nerves exit the vertebral column through _____
4. The spinal cord has a _____ diameter at its superior end
5. Axons supplying the upper limbs enter and exit the cord at _____
6. Axons supplying the lower limbs enter and exit the cord at _____
7. What is the conus medullaris? _____
8. The cauda equina is composed of _____

B. Meninges of the Spinal Cord

1. The meninges are composed of _____
2. The dura mater is most _____ and _____
 - a. The dura mater is continuous with _____ of the spinal nerves
3. Where is the epidural space? _____
4. What is in the epidural space? _____
 - a. Injecting anesthetics into this space is called _____
5. Describe the arachnoid mater: _____
6. Where is the subdural space? _____
7. What is in the subdural space? _____
8. The pia mater is _____
9. What is the filum terminale? _____
10. Where is the subarachnoid space? _____
11. What is in the subarachnoid space? _____
12. The spinal cord is held in place by _____

 - a. These attachments are called _____

C. Cross Section of the Spinal Cord

1. The peripheral white matter consists of _____
2. The central gray matter consists of _____
3. List the two deep clefts partially separating the two halves of the spinal cord:
 - a. _____
 - b. _____
4. The white matter is divided into 3 columns or funiculi called:
 - a. _____
 - b. _____
 - c. _____
5. Each white column is subdivided into _____
 - a. Axons within a single nerve tract carry _____
6. The central gray matter is organized into three horns called:
 - a. _____
 - b. _____
 - c. _____
7. What connects the two halves of the spinal cord? _____
8. Where is the central canal? _____
9. The ventral root is formed by _____
10. The dorsal root is formed by _____
11. The dorsal and ventral root join together to form _____
12. Where is the dorsal root ganglion? _____
13. Organization of Neurons in the Spinal Cord and Spinal Nerves
 - a. Sensory Neurons
 1. Where are the cell bodies of sensory neurons? _____
 2. Which root contains axons of sensory neurons? _____
 3. Sensory neurons enter what part of the gray matter? _____
 - b. Motor Neurons
 1. Where are the cell bodies of somatic motor neurons?

2. Where are the cell bodies of autonomic motor neurons?

3. Axons from the motor neurons form the _____

c. Spinal nerves contain both _____ & _____

II. Reflexes

A. Reflex Arc

1. A reflex arc is the basic _____

2. List the five basic components of a reflex arc:

a. _____

b. _____

c. _____

d. _____

e. _____

3. A reflex is an automatic _____

4. Functionally reflexes are generally _____

B. Stretch Reflex

1. A reflex in which muscles _____ in response to _____

2. What is the sensory receptor? _____

a. The cells are contractile only _____

b. The contractile ends are innervated by _____

c. The noncontractile centers are innervated by _____
that synapse directly with _____

3. When a muscle is stretched:

a. Also stretches _____

b. Stretch stimulates _____

c. Sensory neurons stimulate _____

d. Alpha motor neurons _____

e. Resulting in _____ of the _____

4. The stretch reflex is important in maintaining _____

C. Golgi Tendon Reflex

1. This reflex prevents _____
2. What are Golgi tendon organs? _____

- a. They are located near _____
3. Golgi tendon organs have a high threshold and are sensitive only to _____
4. When a great amount of tension is applied to the tendon:
 - a. Sensory neurons of the _____
 - b. The sensory neurons stimulate _____
 - c. Which inhibit _____
 - d. Causes muscle to _____

D. Withdrawal Reflex

1. Functionally the withdrawal reflex _____
2. Stimulation of pain receptors:
 - a. Action potentials conducted by _____
 - b. Through _____ to _____
 - c. Synapse with _____
 - d. Which in turn synapse with _____
 - e. Alpha motor neurons usually stimulate _____
 - f. Contraction removes _____
 - g. Collateral branches of sensory neurons _____
 1. This provides _____
3. Reciprocal Innervation
 - a. Collateral axons of sensory neurons:
 1. That carry _____
 2. Synapse with _____
 3. In the _____
 4. Which synapse with & inhibit _____
of _____

4. Crossed Extensor Reflex

a. When neurons stimulate withdrawal of a limb:

1. Collateral axons extend _____
2. To the _____
3. Synapse with _____
4. That innervate _____

b. When a _____ reflex is initiated in one lower limb the crossed extensor reflex causes _____

III. Spinal Cord Pathways

A. Ascending Tracts

1. Sensory neurons of a reflex arc send action potentials along _____

a. This causes perception _____

B. Descending Tracts

1. Carry action potentials to _____
2. The neurotransmitters released either _____ or _____ motor neurons in the anterior gray horn

IV. Structure of Spinal Nerves

A. Peripheral nerves consist of:

1. _____
2. _____
3. _____

B. Each axon and its Schwann cell is surrounded by a _____ called the _____

C. What is the perineurium? _____

1. It surrounds _____ to form _____

D. The third layer of dense connective tissue is called _____

1. This layer binds the _____ to form a _____

V. Spinal Nerves

A. General

1. The first pair of spinal nerves exits the vertebral column between the _____ and the _____
2. All other pairs of spinal nerves exit the vertebral column through _____ between _____
3. Each spinal nerve is designated by a _____ & a _____
 - a. The letter designates _____
 - b. In each region the number 1 spinal nerve would be most _____
4. What is a dermatome? _____

5. Each spinal nerve has a _____ and a _____ ramus
6. Communicating rami are found in the _____ regions
 - a. These carry axons associated with _____
7. The dorsal rami innervate _____
 - a. They also innervate _____
8. The ventral rami in the thoracic region form _____
 - a. These nerves innervate _____
9. The ventral rami of the other spinal nerves form _____
10. What does plexus mean? _____
11. What forms a plexus in the spinal cord? _____
12. Nerves that arise from plexuses contain axons from _____

B. Cervical Plexus

1. A relatively small plexus originating from spinal nerves _____
2. Nerves derived from the cervical plexus innervate:
 - a. Superficial _____
 1. Including _____
 - b. Skin _____
 - c. Posterior _____
3. An important derivative of the cervical plexus is the _____

- a. The nerve originates from spinal nerves _____
- b. The nerve innervates the _____
- c. If the nerve were severed a person would have trouble _____

C. Brachial Plexus

- 1. A plexus originating from spinal nerves _____
 - a. There is also a connection from spinal nerve _____
- 2. Axillary Nerve
 - a. Which muscles does it innervate?
 - 1. _____
 - 2. _____
 - b. It also provides sensory innervation to:
 - 1. _____
 - 2. _____
- 3. Radial Nerve
 - a. Which muscles does it innervate?
 - 1. _____
 - 2. _____
 - 3. _____
 - b. Its cutaneous sensory innervation is to:
 - 1. _____
 - 2. _____
- 4. Musculocutaneous Nerve
 - a. Which muscles does it innervate? _____
 - b. Provides cutaneous sensory innervation to _____
- 5. Ulnar Nerve
 - a. Which muscles does it innervate?
 - 1. _____
 - 2. _____
 - b. The sensory distribution is to _____

6. Median Nerve

a. Which muscles does it innervate?

1. _____

2. _____

b. The cutaneous sensory innervation is to _____

7. Other Nerves of the Brachial Plexus

a. Supply most of the muscles acting on _____

b. Supply the cutaneous innervation of _____

D. Lumbar and Sacral Plexuses

1. Lumbar plexus originates from spinal nerves _____

2. Sacral plexus originates from spinal nerves _____

3. The term "lumbosacral plexus" refers to _____

4. Obturator Nerve

a. Supplies the muscles that _____

b. Its cutaneous sensory distribution is to _____

5. Femoral Nerve

a. Which muscles does it innervate?

1. _____

2. _____

3. _____

b. Its cutaneous sensory innervation is:

1. _____

2. _____

6. Tibial and Common Fibular Nerves

a. They are jointly referred to as the _____

1. It is by far the _____ in the body

b. Tibial Nerve

1. Which muscles does it innervate?

a. Posterior _____

b. Plantar _____ & skin _____

2. It supplies cutaneous innervation:

a. _____

b. _____

c. Common Fibular Nerve

1. Which muscles does it innervate? _____

2. The cutaneous distribution is to the:

a. _____

b. _____

7. Other Lumbosacral Plexus Nerves

a. List the muscles innervated by other nerves arising from the plexus:

1. _____

2. _____

3. _____

b. List the skin areas innervated by other nerves arising from the plexus:

1. _____

2. _____

3. _____

4. _____

c. Which nerve plays an important role in sexual stimulation and response?

E. Coccygeal Plexus

1. A very small plexus formed by spinal nerves _____ & _____

2. Supplies motor innervation to muscles _____

3. Supplies sensory cutaneous innervation to skin _____