Functions of the Spinal Cord

- Transmit
- Transmit
- Integrate
Transmitting Information

**Ascending**

- Dorsal white column
- Dorsal spinocerebellar tract
- Ventral spinocerebellar tract
- Lateral spinothalamic tract

**Descending**

- Ventral white commissure
- Lateral reticulospinal tract
- Lateral corticospinal tract
- Rubrospinal tract
- Medial reticulospinal tract
- Ventral corticospinal tract
- Vestibulospinal tract
- Tectospinal tract

- Fasciculus gracilis
- Fasciculus cuneatus
Integration - Reflexes

1. Receptor
2. Sensory neuron
3. Integration center
4. Motor neuron
5. Effector

Stimulus
Skin

Interneuron
Spinal cord (in cross section)
Spinal Cord→ Protected by →

- Bone
- Meninges
- Cerebrospinal fluid
Bony Protection
Meninges ➔ 3 Membranes surrounding the spinal cord

Pia mater
Arachnoid mater
Dura mater
Meninges – Basic Arrangement

- Spinal Cord
- Pia mater
- Arachnoid mater
- Dura mater
- Epidural space
- Subarachnoid space
Produced from blood by specialized capillaries (choroid plexuses) in the brain.

**CSF**

**Functions:**
1. Support
2. Protect
3. Buffer
Spinal Cord Anatomy

Foramen magnum – L1
31 spinal nerve pairs
31 spinal segments
Dermatomes
Spinal Cord Anatomy
Conus Medullaris & Cauda Equina
Filum Terminale
Spinal Cord – Cross Sectional Anatomy

Gray Matter –
Somata
Dendrites
Unmyelinated axons

White Matter – Myelinated axons
Spinal Cord – Cross Sectional Anatomy

White Matter – Organized into columns and tracts

**Ascending**
- Dorsal white column
- Dorsal spinocerebellar tract
- Ventral spinocerebellar tract
- Lateral spinothalamic tract
- Ventral spinothalamic tract
- Fasciculus gracilis
- Fasciculus cuneatus

**Descending**
- Ventral white commissure
- Lateral reticulospinal tract
- Lateral corticospinal tract
- Rubrospinal tract
- Medial reticulospinal tract
- Ventral corticospinal tract
- Vestibulospinal tract
- Tectospinal tract
Basic Structure of a Nerve

- Axon
- Myelin sheath
- Endoneurium
- Perineurium
- Epineurium
- Fascicle
Spinal Nerve Anatomy

Ventral and Dorsal Roots

Ventral and Dorsal Rootlets

Dorsal Root Ganglion
Spinal Rami

Ventral ramus

Dorsal ramus
Motor and sensory signals to/from the posterior trunk

Dorsal ramus
Ventral ramus

Motor and sensory signals to/from the anterior trunk and limbs
All ventral rami (Except T2-T12) → Form → Interlaced bundles of nerve fibers

Nerve Plexuses

4 major plexuses

Cervical Plexus
Brachial Plexus
Lumbar Plexus
Sacral Plexus

*Primarily serve the limbs*
Ventral rami:

- Lesser occipital nerve
- Greater auricular nerve
- Transverse cervical nerve
- Ansa cervicalis
- Phrenic nerve
- Supraclavicular nerves

Segmental branches:

- C1
- C2
- C3
- C4
- C5

Mostly cutaneous nerves

Cervical Plexus
Brachial Plexus

Supplies the upper limb

Gives rise to several important nerves

Axillary
Musculo-cutaneous
Radial
Ulnar
Axillary Nerve

Carries sensory info from the shoulder region and motor commands to the deltoid muscle.
Musculocutaneous Nerve

Carries sensory info from the lateral arm and motor commands to the biceps brachii and brachialis muscles.
Radial Nerve

Carries sensory info from the posterior arm and motor commands to the triceps brachii, wrist extensors and brachioradialis muscles.
Ulnar Nerve

Carries sensory info from the palm and the medial hand/fingers and sends motor commands to the wrist flexors and intrinsic hand muscles.
Lumbar Plexus

Supplies much of the lower limb

Gives rise to several important nerves

Part of the lumbosacral plexus

Femoral

Obturator

Obturator

Femoral
Femoral Nerve

Carries sensory info from much of the thigh, leg, and foot and sends motor commands to quadriceps femoris muscles.
Obturator Nerve

Carries sensory info from the thigh and sends motor commands to adductor muscles.
Sacral Plexus

Part of the lumbosacral plexus

Gives rise to several important nerves

Supplies much of the pelvis, thigh, and leg

Superior gluteal
Inferior gluteal
Pudendal
Sciatic

Superior gluteal
Inferior gluteal
Pudendal
Sciatic
Sciatic Nerve

Carries sensory info from the skin of much of the lower limb and sends motor commands to hamstring muscles as well as other muscles of the lower leg and feet.
Gluteal Nerves

Primarily send motor commands to abductor muscles of the thigh and to the gluteus maximus.
Pudendal Nerve
Carries sensory info from the external genitalia and supplies motor commands to the external urethral and anal sphincters.