NOTES
SPINAL CORD & NERVES

BRACHIAL PLEXUS

osms.it/brachial-plexus

- Network of nerves innervating shoulder, arm, hand (supply afferent/sensory, efferent/motor nerve fibers); one on each side of body
- Begins as five roots → combine to three trunks → split into six divisions (three anterior, three posterior) → combine into three cords → end in five terminal branches; also preterminal (collateral) branches

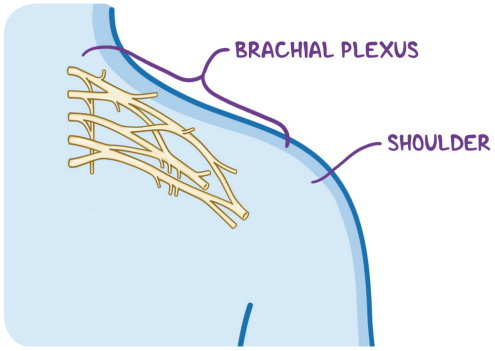

Figure 56.1 Brachial plexus location in body.

ROOTS
- *First four*: from last four cervical nerves (C5, C6, C7, C8)
- *Last one*: from first thoracic nerve (T1)
- Long thoracic nerve (LT) branches off from C5, C6, C7
  - Innervates serratus anterior
- Dorsal scapular (DS) nerve branches off from C5
  - Innervates rhomboid muscles
- Phrenic nerve contributed to by C5
  - Innervates diaphragm

TRUNKS
- C5, C6 form superior trunk
- C7 remains as middle trunk
- C8, T1 form inferior trunk
- Suprascapular nerve branches off from superior trunk
  - Innervates supraspinatus, infraspinatus, acromioclavicular, glenohumeral joints

DIVISIONS
- Each trunk splits into anterior, posterior division

CORDS
- Lateral cord
  - Superior, middle trunk anterior divisions
- Posterior cord
  - All three trunk posterior divisions
- Medial cord
  - Inferior trunk anterior division
- Lateral pectoral nerve branches off from lateral cord
- Upper, middle, lower subscapular nerves branch off from posterior cord
- Medial cutaneous nerves of arm, forearm, medial pectoral nerve branch off from medial cord

TERMINAL BRANCHES
- Musculocutaneous nerve comes from lateral cord
  - Innervates biceps brachii, brachialis, coracobrachialis
- Median nerve formed from lateral, medial cords
  - Innervates flexors of forearm, hand

- Axillary, radial nerves split out from posterior cord
  - Axillary nerve innervates deltoid, teres minor
  - Radial nerve innervates triceps brachii, brachioradialis, forearm extensors
- Ulnar nerve off from medial cord
  - Innervates wrist, fingers

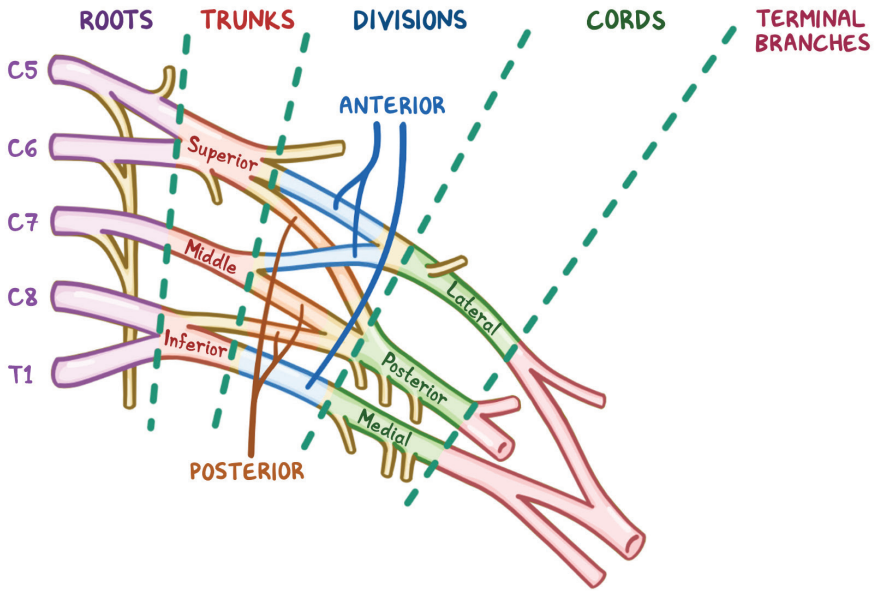

Figure 56.2 Divisions of the brachial plexus.

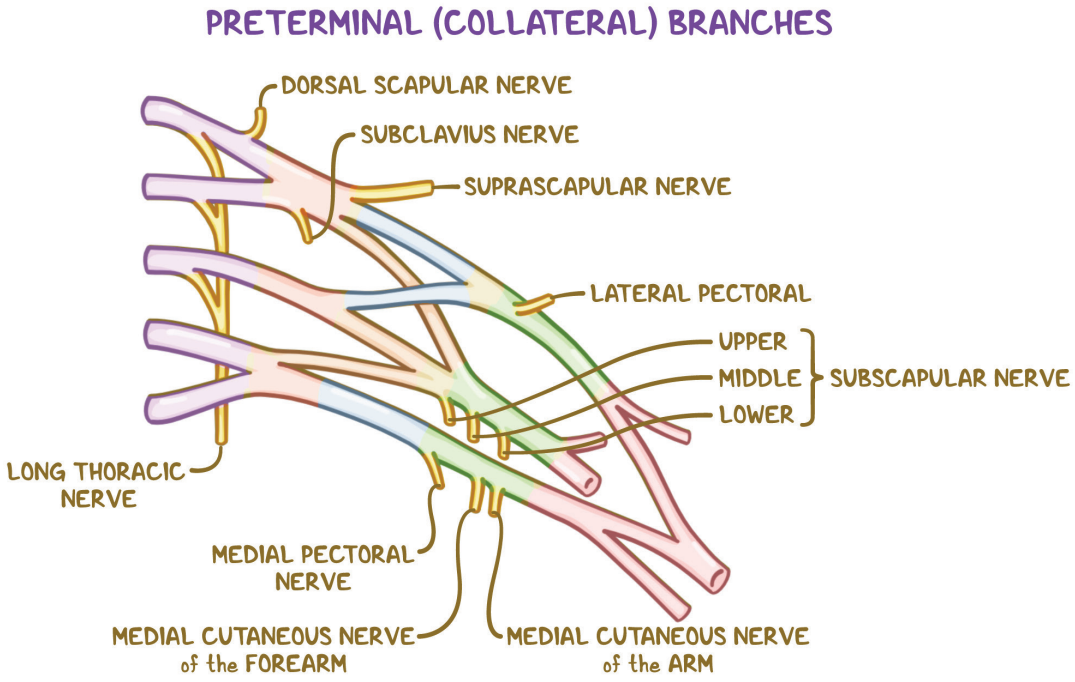

Figure 56.3 Names and locations of brachial plexus' collateral branches.

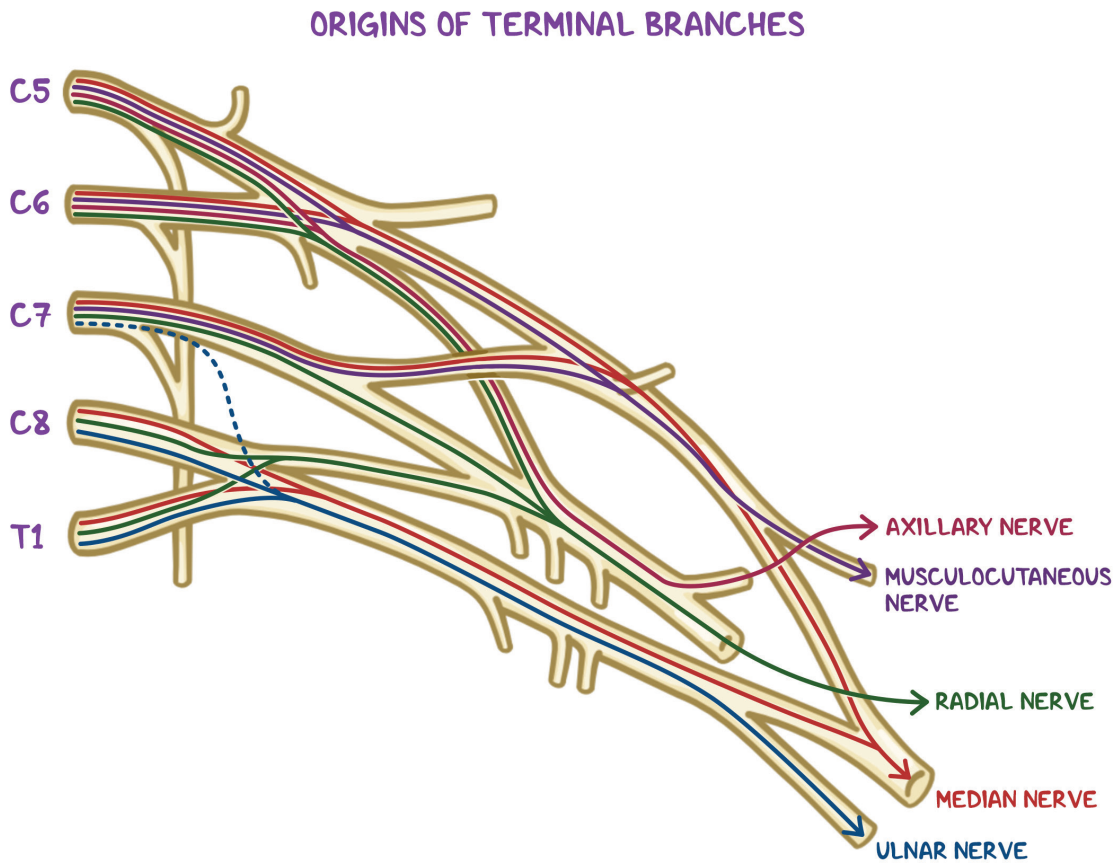

Figure 56.4 Contributions of the spinal nerves to the brachial plexus' terminal branches.

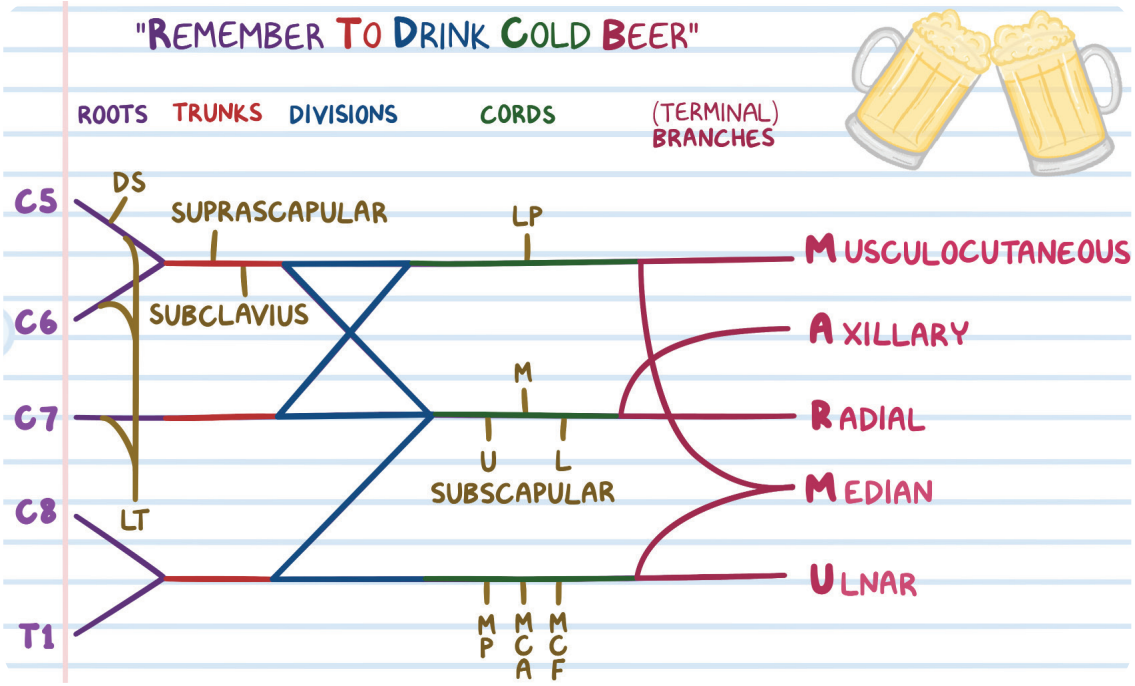

Figure 56.5 A simplified diagram of the brachial plexus with mnemonics for names and order of divisions (Remember To Drink Cold Beer) and the terminal branches (MARMU).

CRANIAL NERVES

osms.it/cranial-nerves

- 12 nerve pairs originating in brain, brainstem
  - Supply body (primarily head, neck) with motor, sensory information
- Includes olfactory, optic, oculomotor, trochlear, trigeminal, abducens, facial, vestibulocochlear, glossopharyngeal, vagus, accessory, hypoglossal nerves

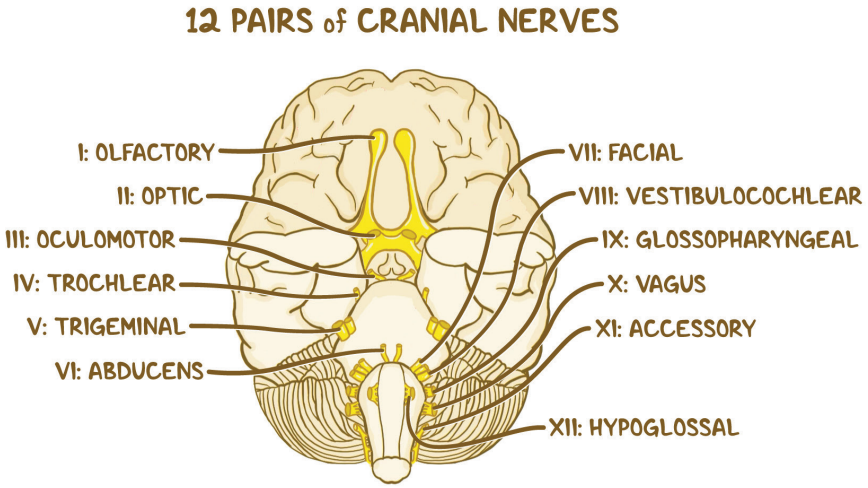

Figure 56.6 The cranial nerves originate from the brain (including brainstem).

MNEMONIC:
Cranial Nerve Names

On
Old
Olympus
Towering
Top,
A
Fine
Victorian
Gentleman
Viewed
A
Hawk

MNEMONIC:
Cranial Nerve Functions
(S = sensory, M = motor)

Some
Say
Marry
Money
But
My
Brother
Says
Big
Brains
Matter
More

I – OLFACTORY NERVE (SENSORY)

- *Function*: smell
- Arises from primary olfactory cortex (temporal lobe)
- Neurons form olfactory tracts → run to olfactory bulb (above cribriform plate of ethmoid bone)
- Receives information from sensory nerve fibers (axons from nasal cavity's olfactory neurons) which synapse with olfactory bulb's neurons

II – OPTIC NERVES (SENSORY)

- *Function*: vision
- Emerge from eye retinas
- Pass through optic canal, unite at optic chiasm (partial decussation occurs) → optic nerve fibers form optic tracts → synapse at different nuclei
  - Suprachiasmatic nucleus in hypothalamus (regulates sleep-wake cycle)
  - Pretectal nucleus in midbrain (regulates eye reflexes)
  - Lateral geniculate nucleus in thalamus (thalamic fibers form optic radiations, run to occipital visual cortex → determines sight)

III – OCULOMOTOR NERVE (MOTOR)

- *Function*: eye movement
- Arises from ventral midbrain; runs through superior orbital fissure to eye
- Splits into superior, inferior branch
  - Superior branch innervates levator palpebrae superioris (raises upper eyelid), superior rectus (elevates eye)
  - Inferior branch innervates inferior oblique (abducts eyeball), inferior rectus (depresses, adducts eyeball), medial rectus (adducts eyeball) with proprioception; controls pupil constriction (sphincter pupillae), visual focusing (ciliaris) via ciliary ganglion

IV – TROCHLEAR NERVE (PRIMARILY MOTOR/SOME SENSORY)

- *Function*: eyeball movement
- Arises from dorsal midbrain; runs around midbrain, follows oculomotor nerve through superior orbital fissure
- Innervates superior oblique muscles (abducts, depresses, internally rotates eyeball)

V – TRIGEMINAL NERVE (SENSORY/MOTOR)

- *Function*: facial movement, chewing, temperature, touch, pain
- Emerges from pons; travels to trigeminal ganglion
- Splits into ophthalmic, maxillary, mandibular nerves
  - Opthalmic nerve exits through superior orbital fissure, gives sensory innervation to upper eyelid, nose, forehead, scalp
  - Maxillary nerve exits through foramen rotundum, gives sensory innervation to maxilla, nasal cavity, palate, cheeks' skin
  - Mandibular nerve exits through foramen ovale, gives sensory innervation to tongue (not taste buds), lower lip, lower teeth, chin, temporal scalp. Gives motor innervation to chewing muscles

VI – ABDUCENS NERVE (MOTOR)

- *Function*: eyeball movement
- Emerges from pons; runs through superior orbital fissure
- Innervates lateral rectus muscle (abducts eye)

VII – FACIAL NERVE (SENSORY/MOTOR)

- *Function*: taste, saliva, tears, facial movement (i.e. facial expressions)
- Emerges from pons; enters temporal bone through internal acoustic meatus
- Runs within bone to geniculate ganglion
- Splits into greater petrosal nerve, stapedius nerve, chorda tympani
  - Greater petrosal nerve provides autonomic fibers to lacrimal, nasal, palatine, pharyngeal glands
  - Stapedius nerve sends motor fibers to middle ear's stapedius
  - Chorda tympani gives sensory innervation to taste buds of tongue's anterior two thirds

- Remaining nerve exits skull through stylomastoid foramen
- Splits again into temporal, zygomatic, buccal, mandibular, cervical branches (innervating forehead, nose, cheeks, around eyes/lips, chin)

VIII - VESTIBULOCOCHLEAR NERVE (SENSORY)

- *Function*: hearing, equilibrium
- Emerges from pons; runs through internal acoustic meatus
- Splits into cochlear, vestibular nerves
  - Cochlear nerve supplies cochlea's hearing receptors
  - Vestibular nerve supplies vestibule's equilibrium receptors

IX - GLOSSOPHARYNGEAL NERVE (SENSORY/MOTOR)

- *Function*: swallowing, monitoring blood pressure/oxygen/carbon dioxide
- Arises from medulla; runs through jugular foramen
- Innervates tongue, pharynx
- Sends motor fibers to stylopharyngeus (elevates pharynx in swallowing), parasympathetic motor fibers to parotid salivary glands, sensory fibers to tongue's posterior third
- Conveys information from carotid bodies' chemoreceptors (blood oxygen, carbon dioxide levels), carotid sinus' baroreceptors (blood pressure)

X - VAGUS NERVE (SENSORY/MOTOR)

- *Function*: smooth muscle control, digestive enzyme secretion
- Arises from medulla; runs through jugular foramen
- Dips down into thorax, abdomen
- Sends somatic motor innervation to pharynx, larynx (swallowing), parasympathetic fibers to heart, lungs, abdominal organs (heart rate, breathing, digestion)
- Brings in sensory information from thoracic, abdominal organs; aortic arch's baroreceptors; chemoreceptors in carotid, aortic bodies; epiglottis' taste buds

XI - ACCESSORY NERVE

- *Function*: swallowing; head, shoulder movement
- Considered vagus nerve accessory
- Forms from rootlets emerging from spinal cord; enters skull via foramen magnum, emerges from medulla, runs through jugular foramen
- Innervates trapezius, sternocleidomastoid muscles (head, neck movement); carries sensory proprioceptive information from larynx, pharynx

XII - HYPOGLOSSAL NERVE

- *Function*: tongue movement, speech, swallowing
- Arises from medulla; runs through hypoglossal foramen
- Sends motor fibers to tongue muscles, carries sensory proprioceptive information

I - OLFACTORY NERVE

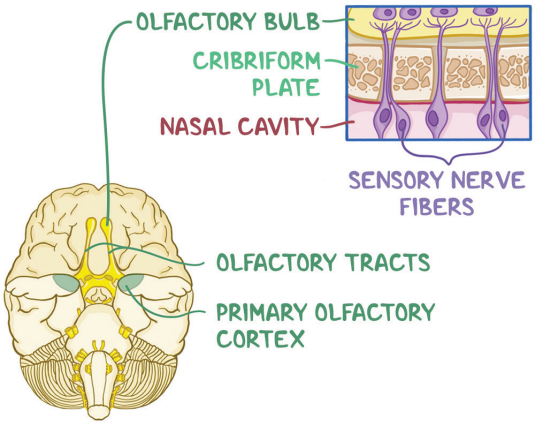

Figure 56.7 CN I: olfactory nerve.

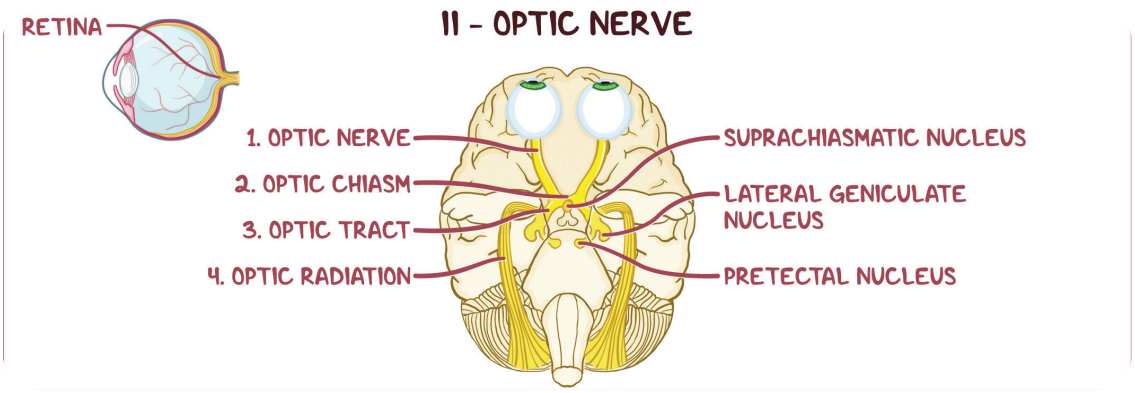

Figure 56.8 CN II: optic nerve.

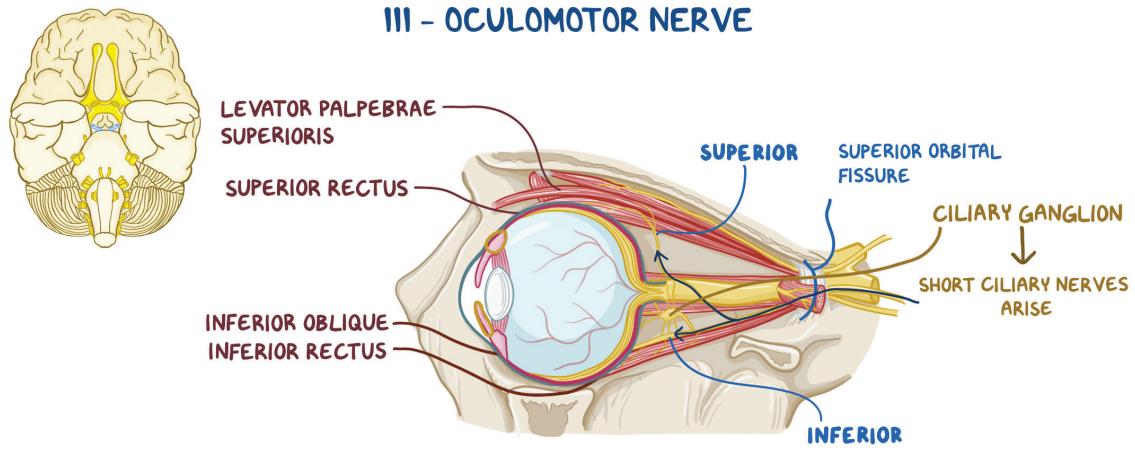

Figure 56.9 CN III: oculomotor nerve.

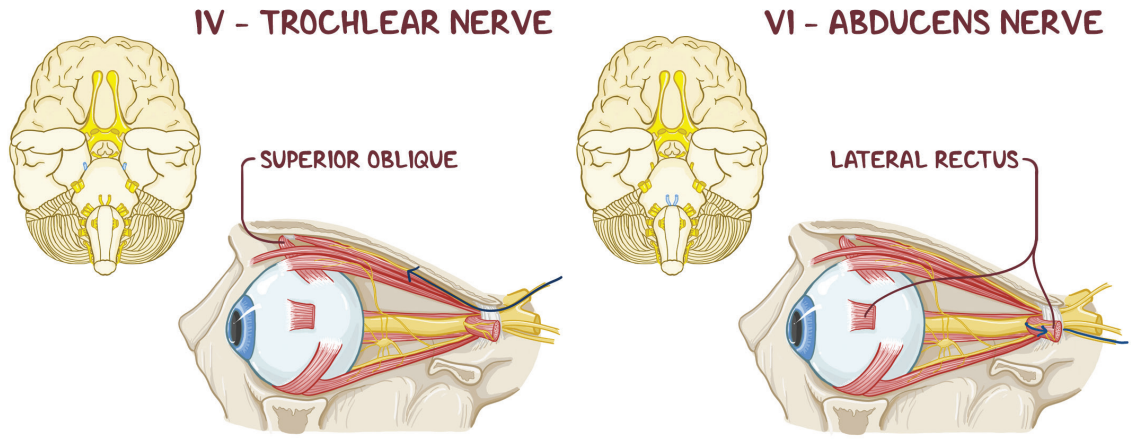

Figure 56.10 CN IV: trochlear nerve and CN VI: abducens nerve. Together, CN III, IV, and VI control eye movement.

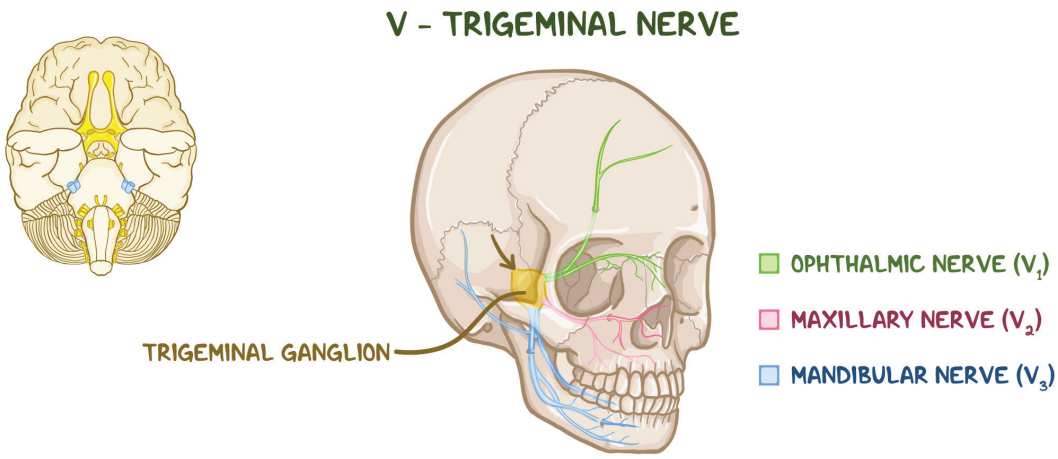

Figure 56.11 CN V: trigeminal nerve. The three branches include the ophthalmic nerve (V_1), maxillary nerve (V_2), and mandibular nerve (V_3).

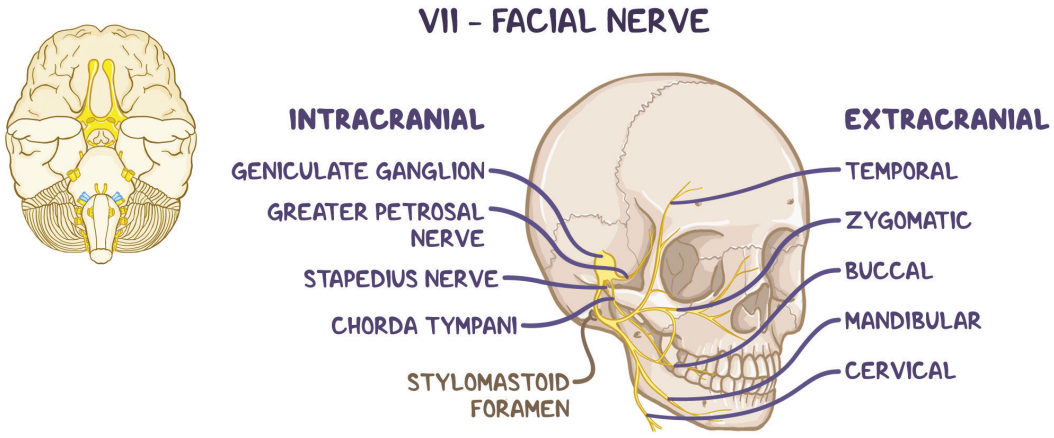

Figure 56.12 CN VII: facial nerve, including the intracranial and extracranial branches.

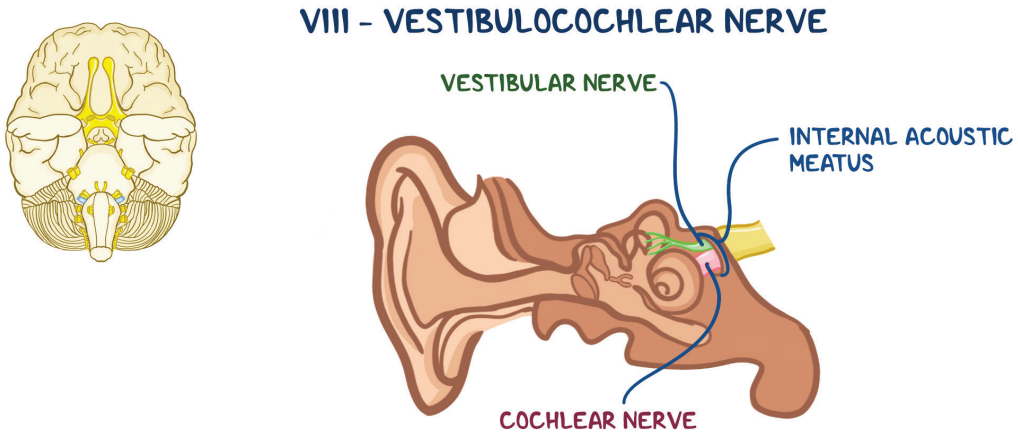

Figure 56.13 CN VIII: vestibulocochlear nerve, which splits into the vestibular and cochlear nerves once it passes through the internal acoustic meatus.

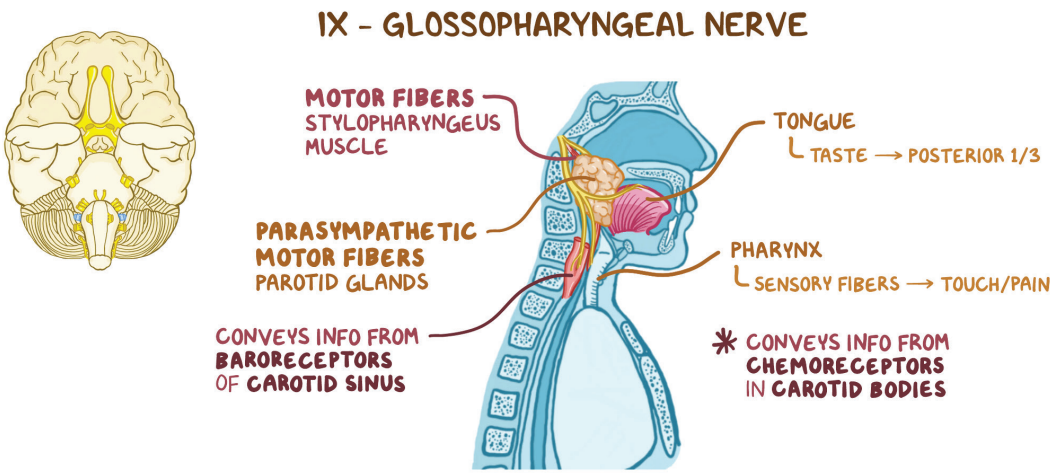

Figure 56.14 CN IX: glossopharyngeal nerve has sensory and motor functions.

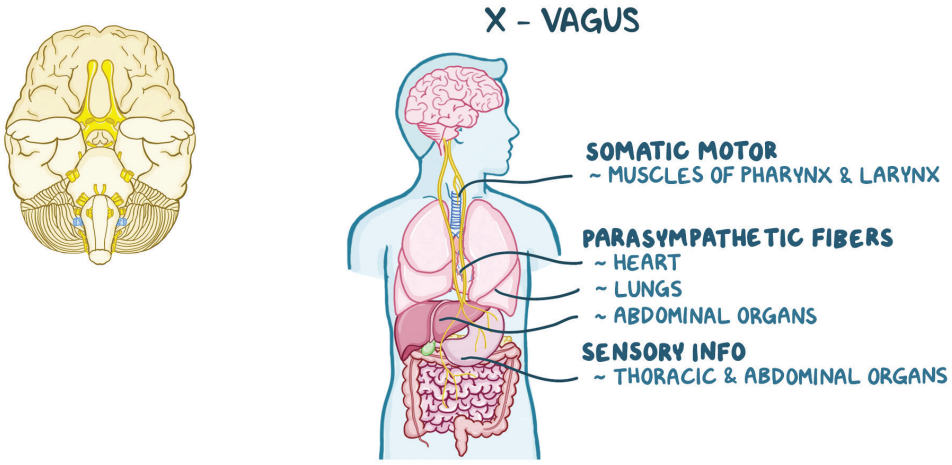

Figure 56.15 CN X: vagus nerve also has sensory and motor functions.

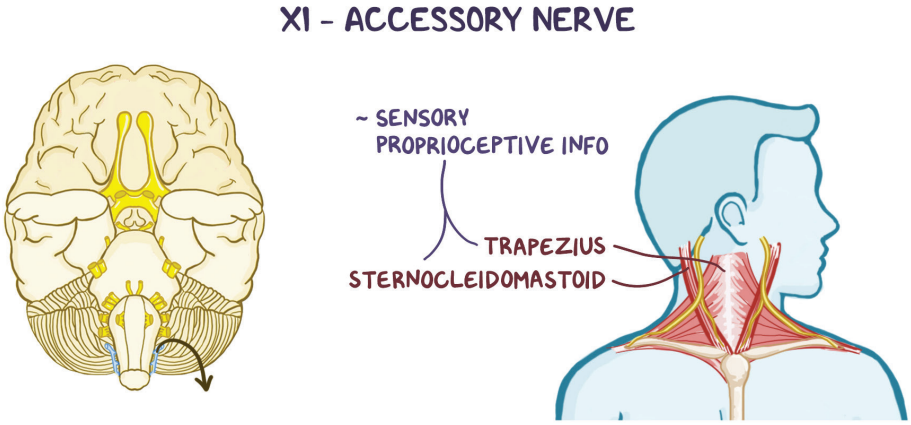

Figure 56.16 CN XI: accessory nerve enters the skull through foramen magnum, then exits again through the jugular foramen. It innervates the trapezius and sternocleidomastoid muscles.

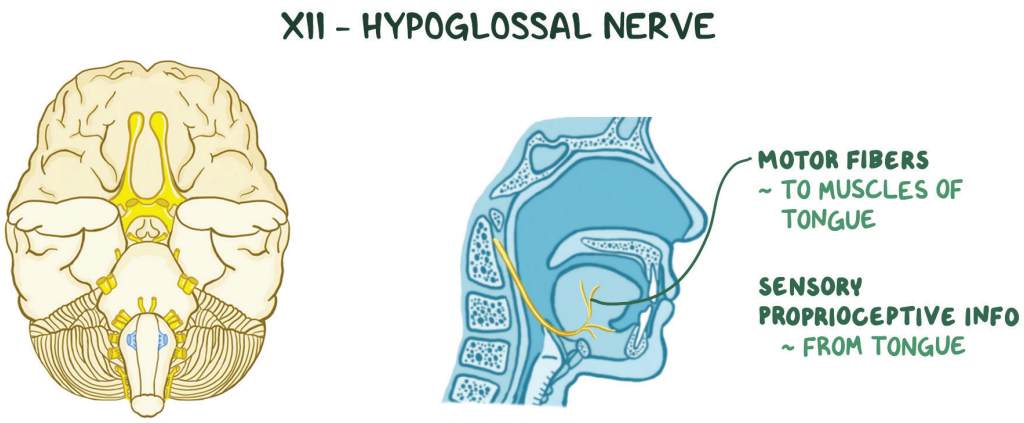

Figure 56.17 CN XII: hypoglossal nerve innervates the tongue and has both motor and sensory function.