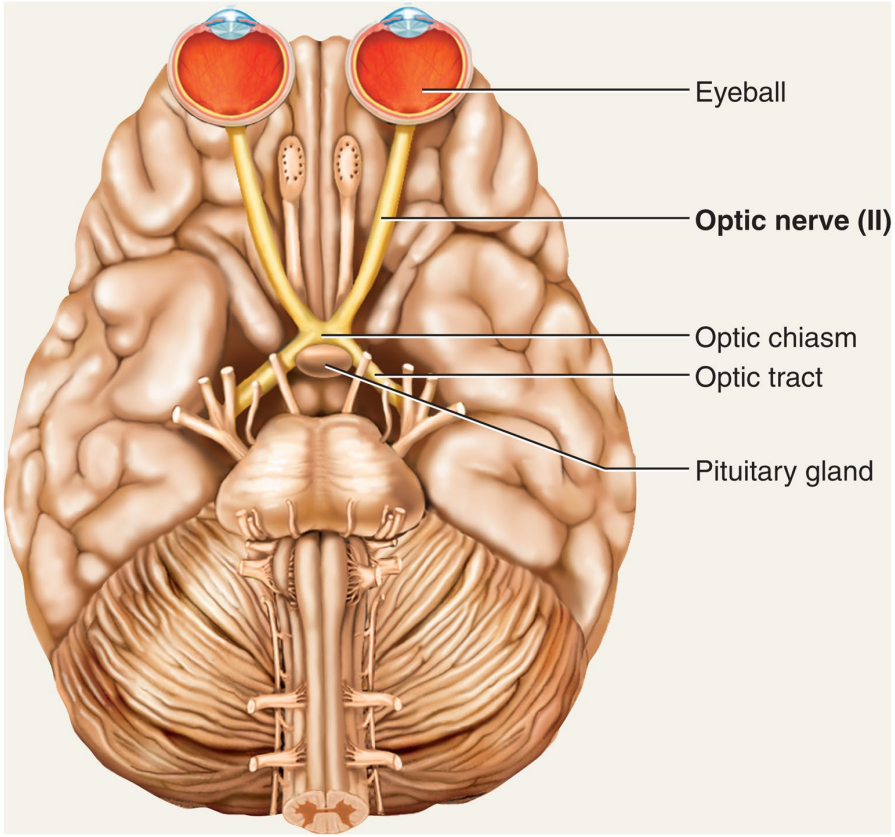
C14.5

Cranial Nerves



Cranial Nerves

•The brain uses spinal nerves to contracts skeletal muscles below the neck. /// most of the input and output travels through the spinal cord

•Cranial nerves = 12 pairs of nerves /// originate from the base (brain stem) of the brain

–exit the cranium through foramina in the skull

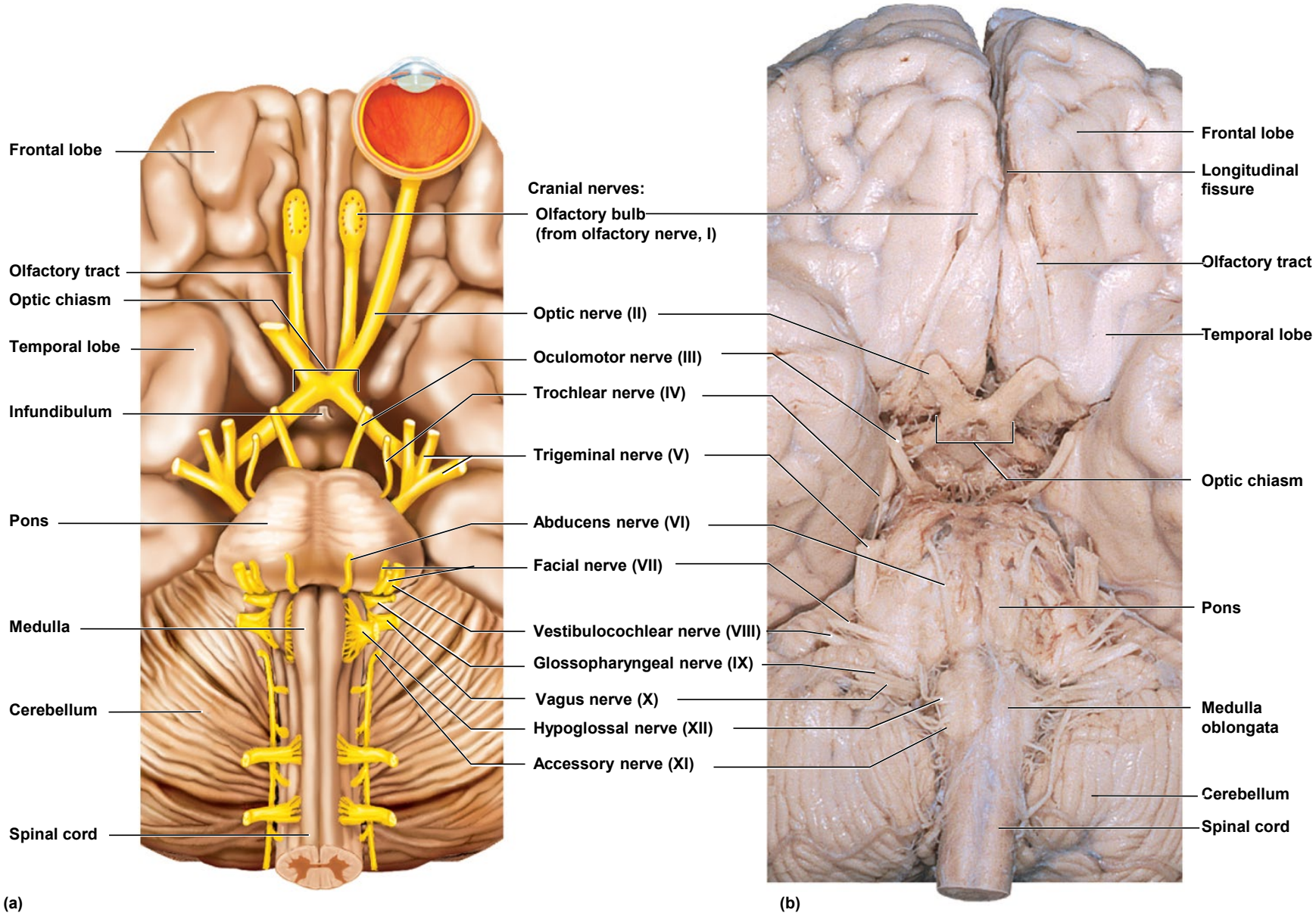
–some are mixed (motor and sensory), but others are only sensory or only motor

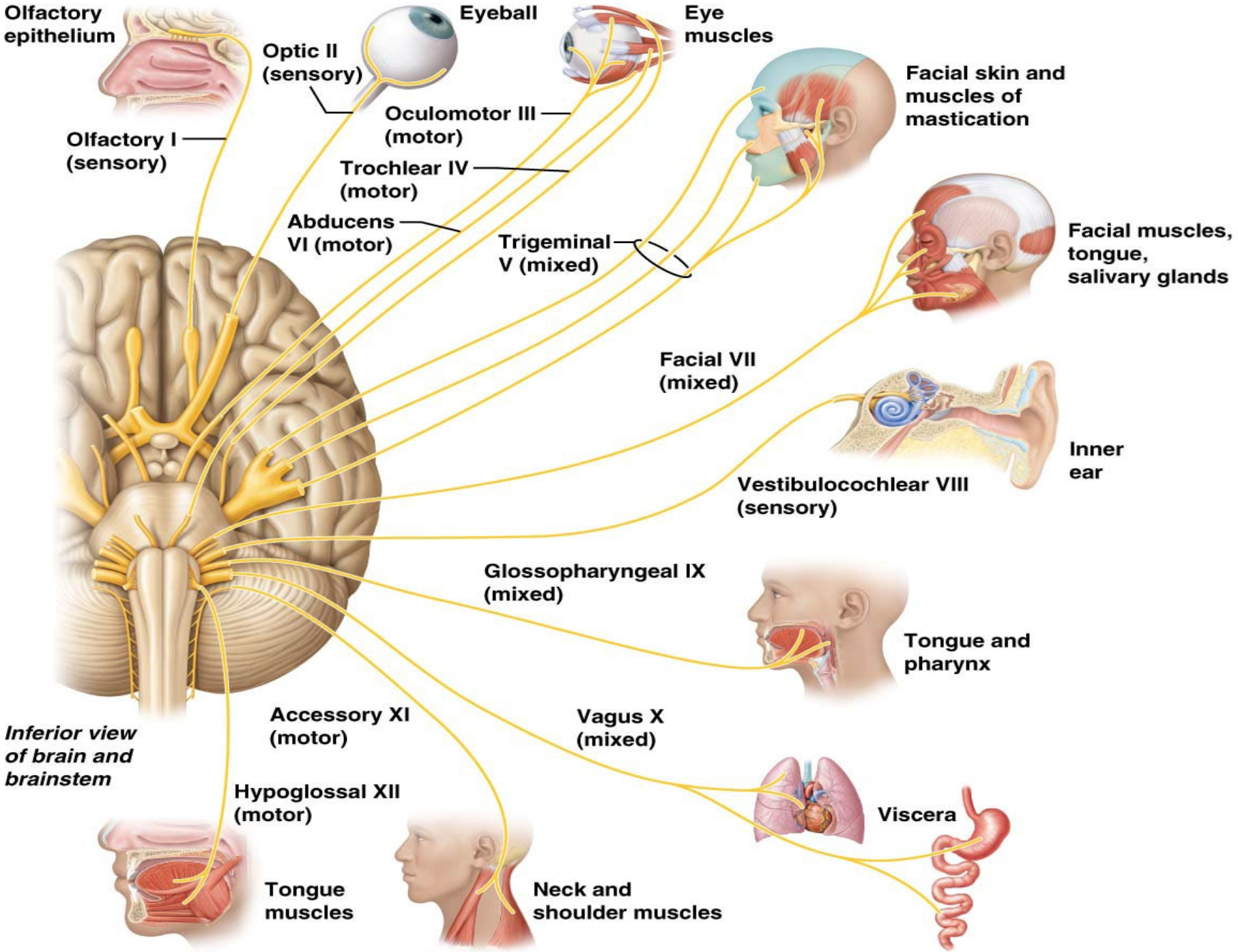
–target tissue is muscles and sense organs located mainly in the head and neck (including facial skeletal muscles)

–canial nerve #10 – Vagus nerve is the exception – innervates thoracic and abdominalpelvic viscera.

You need to know the functions of these four cranial nerves for the Unit Two Exam. Cranial nerves I, II, VIII, and X

“Oh, once one takes the anatomy final, very good vacation ahead.”




Olfactory epithelium
Olfactory I (sensory)
Optic II (sensory)
Eyeball
Oculomotor III (motor)
Trochlear IV (motor)
Abducens VI (motor)
Eye muscles
Trigeminal V (mixed)
Facial skin and muscles of mastication
Facial muscles, tongue, salivary glands
Facial VII (mixed)
Vestibulocochlear VIII (sensory)
Inner ear
Glossopharyngeal IX (mixed)
Tongue and pharynx
Vagus X (mixed)
Viscera
Accessory XI (motor)
Hypoglossal XII (motor)
Tongue muscles
Neck and shoulder muscles
Inferior view of brain and brainstem

Cranial Nerve Pathways

- The origin of a cranial nerve is a nuclei in the brainstem
- CN axons exit through foramen in facial bone to innervate glands and skeletal muscles in head and neck
- Note cranial nerve ten = vagus is the exception because it innervates thoracic and abdominopelvic viscera
- Cranial nerves may be sensory, motor, or mixed.
- Some cranial nerves function as LMN for the somatic motor division // target tissue facial skeletal muscles
- Some cranial nerves are part of the ANS motor division.

Cranial Nerve Classification

- Cranial nerves are classified as **motor**, **sensory**, or **mixed**

  - sensory (**I**, **II**, and **VIII**)

  - motor (**III**, **IV**, **VI**, **XI**, and **XII**) // stimulate muscle but also contain fibers of proprioception

  - mixed (**V**, **VII**, **IX**, **X**) // sensory functions may be quite unrelated to their motor function

  - facial nerve (VII) has sensory role in taste but motor role in facial expression

Cranial Nerve Pathways

- Most cranial nerves carry fibers between brainstem and ipsilateral receptors and effectors

  Lesion in left brainstem causes sensory or motor deficit on same side

  Exceptions are

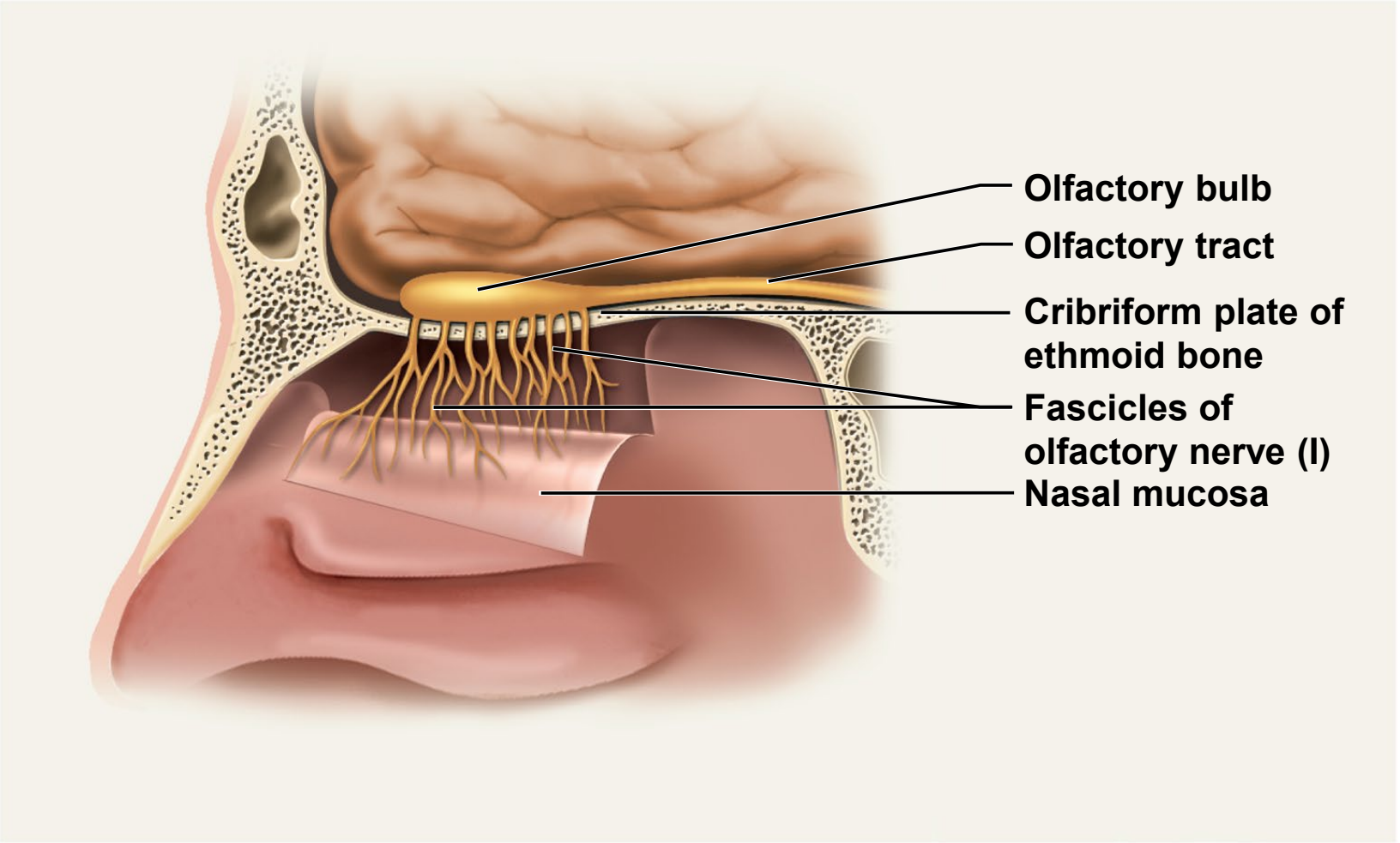
- optic nerve where half the fibers
- decussate

- trochlear nerve where all efferent fibers
- lead to a muscle of the contralateral eye

You Only Need to Know Four of the 12 Cranial Nerves

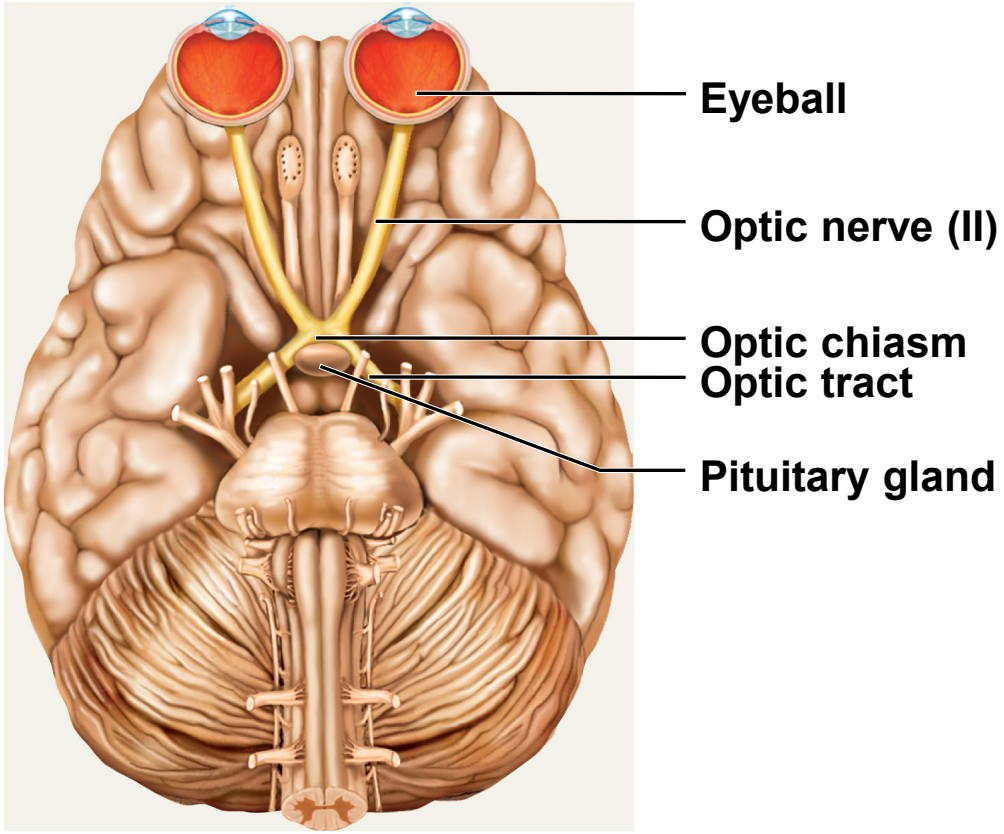
- Olfactory Nerve (CN 1)
- Optic Nerve (CN 2)
- Vestibulocochlear Nerve (CN 8)
- Vagus Nerve (CN 10)

I Olfactory Nerve



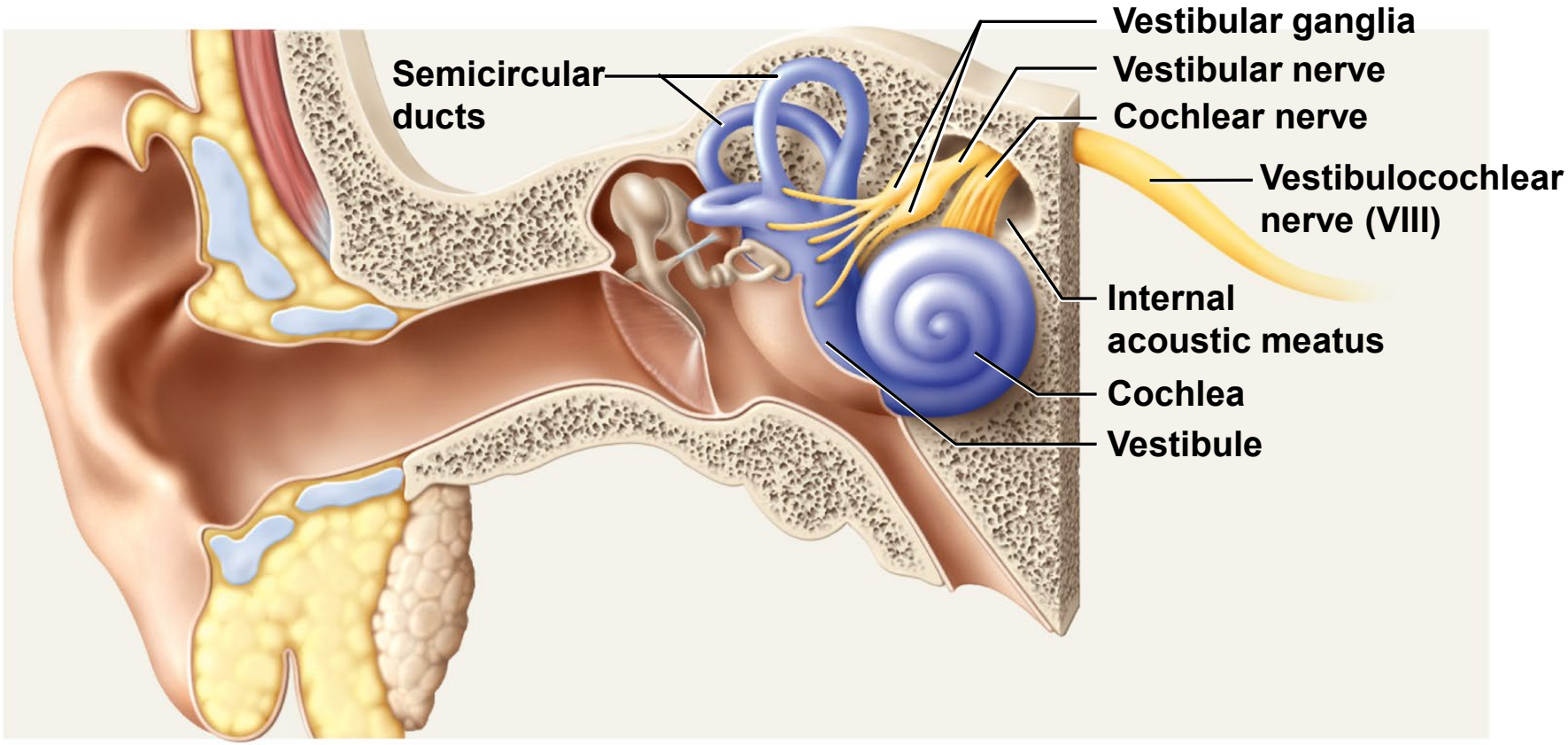
- sense of smell
- damage causes impaired sense of smell

II Optic Nerve



- provides vision
- damage causes blindness in part or all of the visual field

VIII Vestibulocochlear Nerve

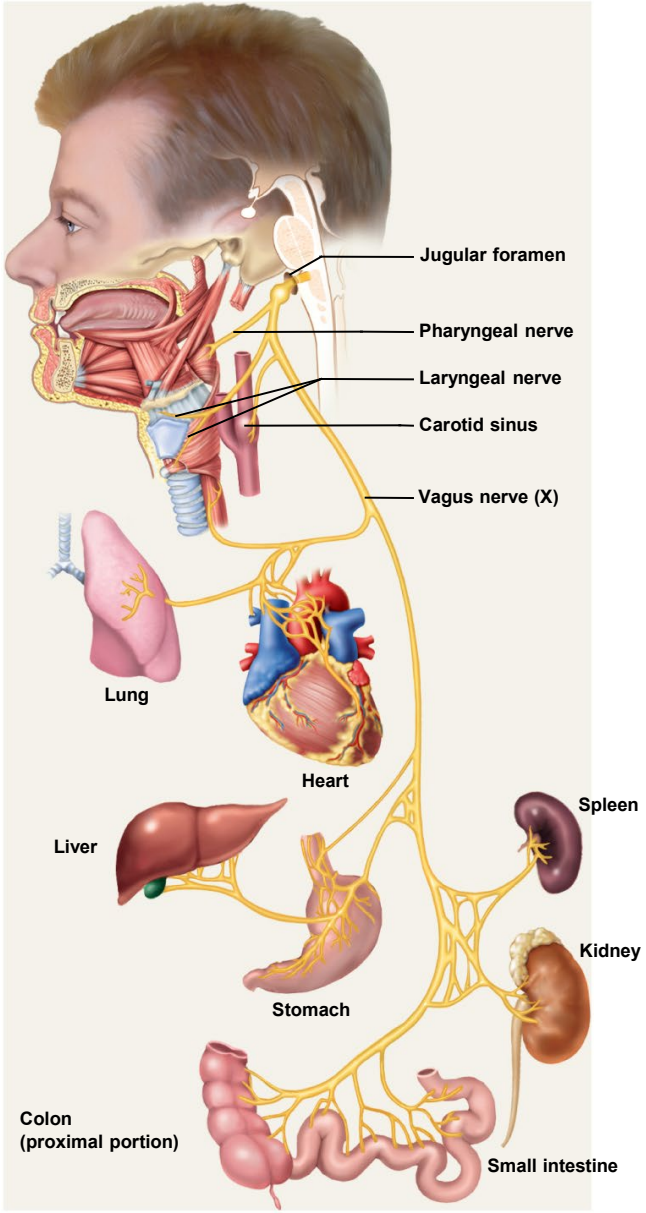


- nerve of hearing and equilibrium

- damage produces deafness, dizziness, nausea, loss of balance and nystagmus (involuntary rhythms oscillation of the eyes from side to side

X Vagus Nerve

- most extensive distribution of any cranial nerve
- major role in the control of cardiac, pulmonary, digestive, and urinary function
- swallowing, speech, regulation of viscera
- damage causes hoarseness or loss of voice, impaired swallowing and fatal if both are cut



Bell's Palsy

Weakness or complete paralysis of the muscles in the face

Associated with cranial nerve VII (facial)

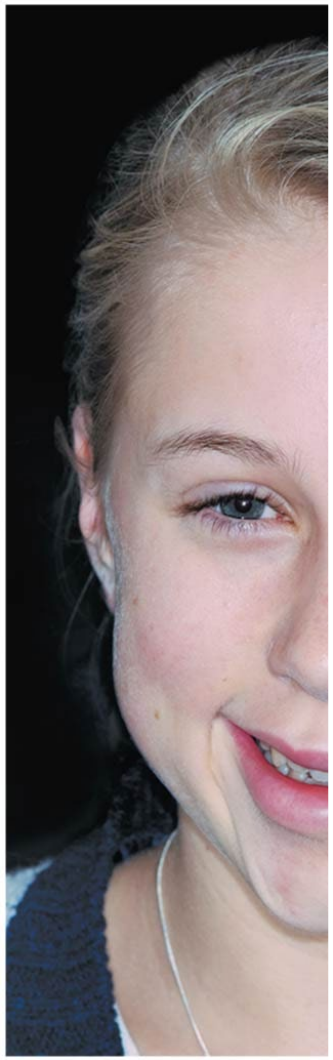
Exact cause unknown but contributing factors may be a virus, tumor, or trauma

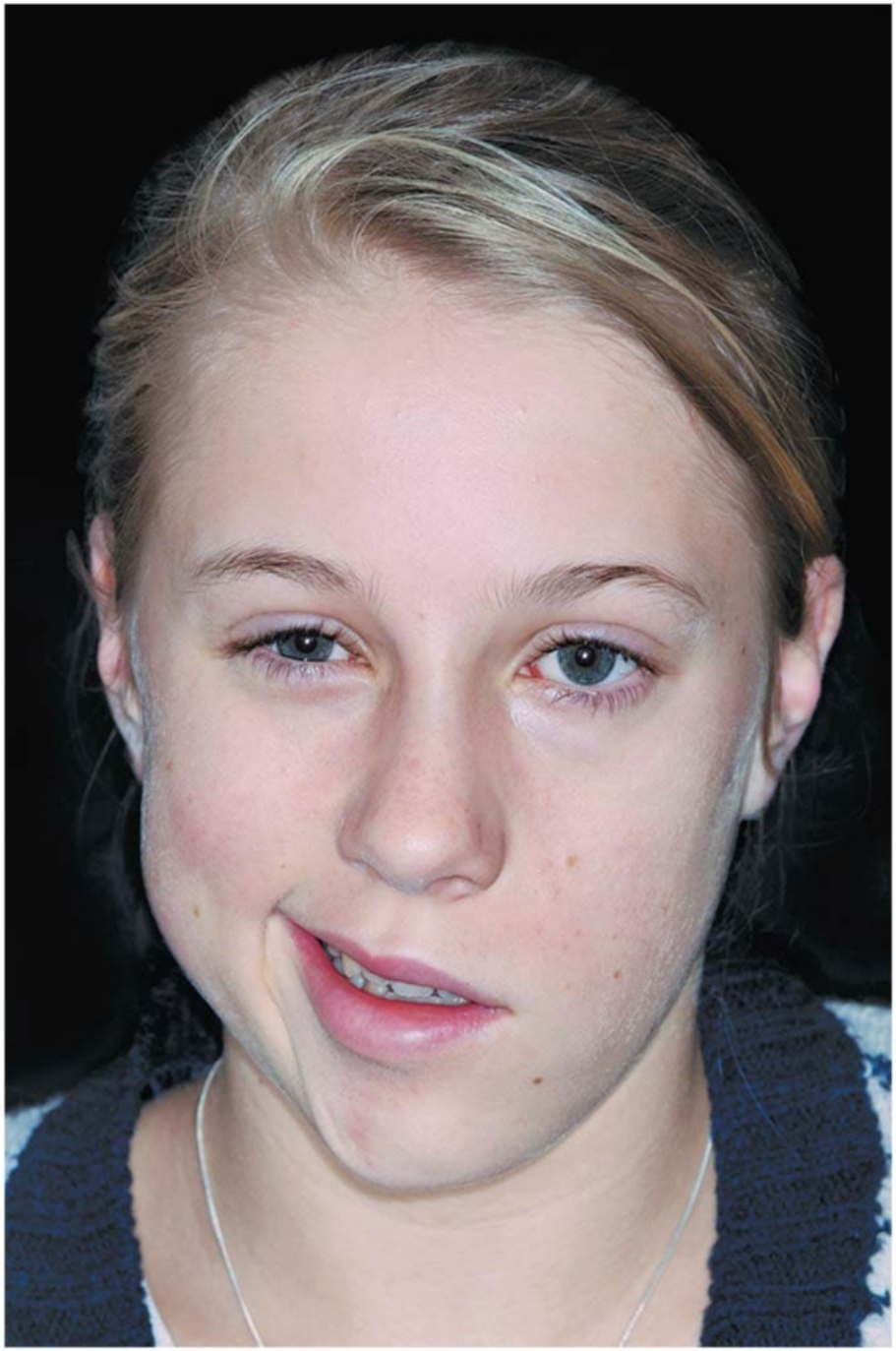
Unaffected side appears normal.

Problems with blinking, lacrimal gland, general facial expression of effective side .

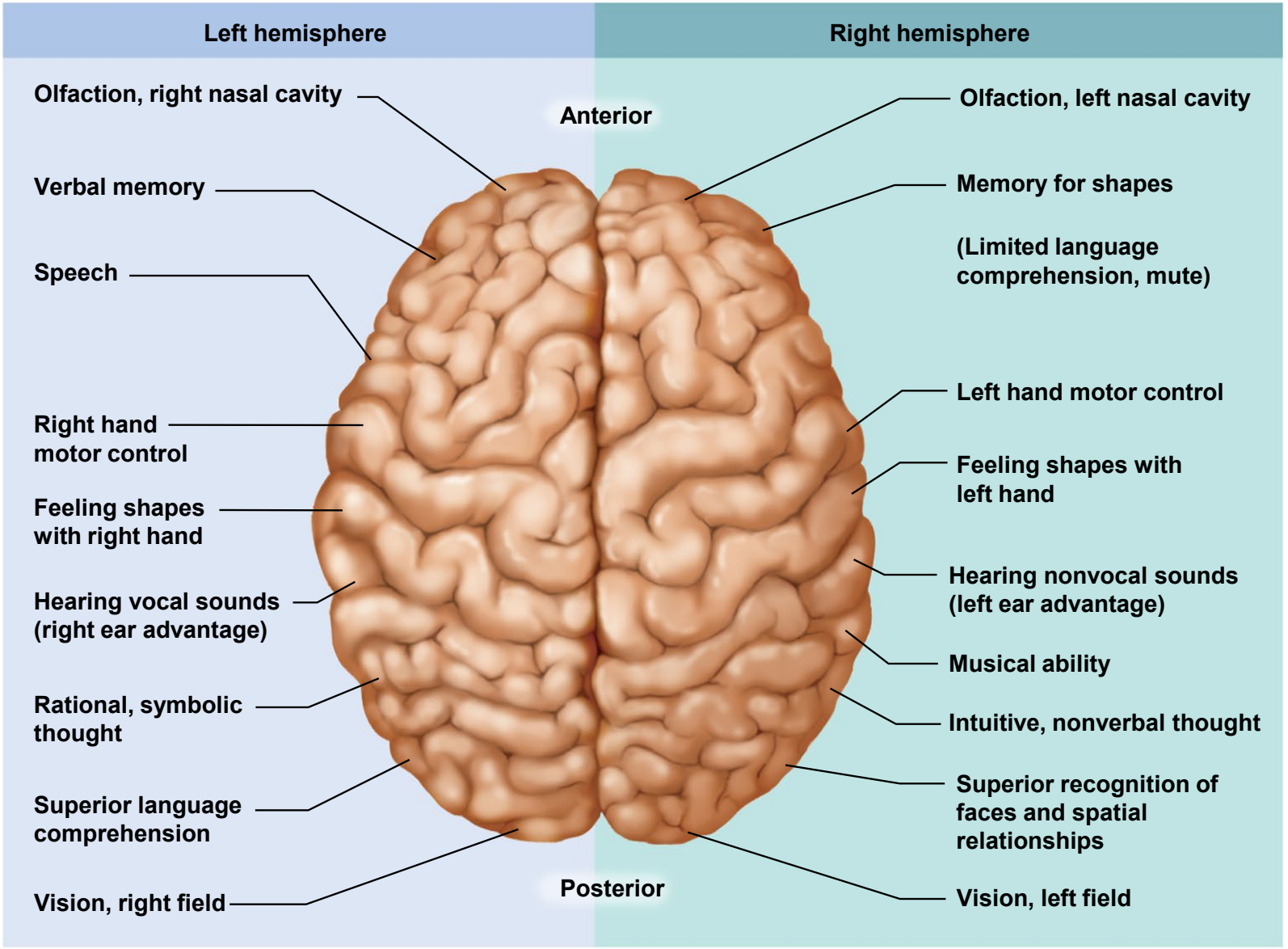
Onset within 72 hours

Often resolves even without treatment.





Cerebral Lateralization



What is the Significance of Cerebral Lateralization?

•Similar right-left cerebral structure but the structures have slightly different cerebral functions

•left hemisphere – language - *categorical hemisphere*

–specialized for spoken and written language

–sequential and analytical reasoning (math and science)

–breaks information into fragments and analyzes it in a linear way

•right hemisphere - *representational hemisphere*

–perceives information in a more integrated "holistic way"

–seat of imagination and insight

–musical and artistic skill

–perception of patterns and spatial relationships

–comparison of sights, sounds, smells, and taste

–intonation of language // able to understand what "the cat is in the bag" phrase means

Cerebral Lateralization

highly correlated with handedness

–left hemisphere is the categorical one in 96% of right-handed people // right hemisphere is categorical in only 4%

–left handed people – right hemisphere is categorical in 15% and left in 70%

lateralization develops with age

–males exhibit more lateralization than females

–males suffer more functional loss when one hemisphere is damaged // note difference in posterior commissure