

VISIBLE BODY®

Cranial Nerves (Part 1)

A nervous system lab activity using Visible Body Suite

Molli Crenshaw, Instructor of Biology, TCU

PRE-LAB EXERCISES

<u>A. Open Visible Body Suite. From the main menu, choose Anatomy & Physiology and select 5.</u> <u>Nervous System and Special Senses. Watch the video 17.1 Nervous System Functions and make the</u> <u>following observations:</u>

1. Which structures make up the nervous system?

2. The video highlights specialized cells of the nervous system (neurons). What is their unique function according to the video?

3. According to the video, what role does the brain play?

4. According to the video, which structures are able to send information to the brain?

B. Use Modules 17.2, 17.3, and 17.4 to make the following observations:



- 1. Which two structures make up the central nervous system (CNS)?
- 2. Where is the brain contained?
- 3. Where is the spinal cord contained?
- 4. Which structures make up the peripheral nervous system (PNS)?
- 5. Use Module 17.2 to answer the questions below:
 - a. What are the two categories of cerebrospinal spinal nerves mentioned in 17.2?

b. How many pairs of cranial nerves are there in the human body?

c. Based on your reading here, what are some of the functions of the cranial nerves?

d. How many pairs of spinal nerves are there in the human body?

e. Based on your reading here, what are some of the functions of the spinal nerves?

<u>C. Cranial nerves are designated both by name and by Roman numeral. Use Module 17.4 to identify the names of each numbered cranial nerve below:</u>



- 1. Cranial Nerve I:
- 2. Cranial Nerve II:
- 3. Cranial Nerve III:
- 4. Cranial Nerve IV:
- 5. Cranial Nerve V:
- 6. Cranial Nerve VI:
- 7. Cranial Nerve VII:
- 8. Cranial Nerve VIII:
- 9. Cranial Nerve IX:
- 10. Cranial Nerve X:
- 11. Cranial Nerve XI:
- 12. Cranial Nerve XII:

D. Use Modules 21.2, 21.3, and 21.4 to learn the functional classification of the cranial nerves. Be sure to identify them both by name and by Roman numeral for practice.

Module 21.2

CN 01



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Module 21.3 Motor Cranial Nerves



Module 21.4 Mixed Cranial Nerves



- 1. Which three cranial nerves are designated as purely sensory?
- 2. Which five cranial nerves are designated as purely motor?
- 3. Which four cranial nerves are designated as mixed?

E. Use Module 17.6 to make the following observations about special sensory organs:



- 1. Are the receptors in these organs classified as part of the CNS or the PNS?
- 2. Nasal Cavity:
 - a. Which sense is promoted by receptors in this cavity?
 - b. Describe the structure of the nasal cavity:

c. Select and hide the following structures of the nasal cavity: nasal cartilages (right and left upper lateral, right and left greater alar), right and left nasal bone, nasal cavity, middle nasal conchae (turbinates).

d. Identify the olfactory bulb. Which cranial nerve is this associated with?

e. Use the Refresh icon to continue identifying special sensory organs.

3. Tongue:

- a. Which sense is promoted by receptors in this organ?
- b. List the sensory nerves associated with the tongue:
- c. Which motor nerve is associated with the tongue?

d. Select and hide the following structures to explore the tongue: gingivae, mandible, hard palate.

e. Use the Refresh icon to continue identifying special sensory organs.

4. Eyes:

- a. Which sense is promoted by receptors associated with these organs?
- b. Which layer of the eye contains the nervous tissue associated with sight?
- c. Select and fade the eye.

d. Zoom in and identify the large sensory nerve that runs to the posterior surface of the eyeball. Which cranial nerve is this?

e. Use the Refresh icon to continue identifying special sensory organs.

5. Nerves to ears:

- a. Which two senses are associated with these organs?
- b. According to the description, which pair of cranial nerves facilitates both sensory functions?

IN-LAB EXERCISES:

Obtain a brain module or a preserved specimen. Use the following modules to guide your exploration of the brain and cranial nerves. As you identify structures, use the textbook icon to answer the questions below. You are responsible for the identification of all bolded terms.





- 1. Cerebrum
- 2. Cerebellum
- 3. Diencephalon
- 4. Midbrain
- 5. **Pons**
- 6. Medulla Oblongata

<u>B. Identification of the Olfactory Nerves (I): Use Modules 21.5 and 21.6 to answer the following questions:</u>

Module 21.5



1. Select the **olfactory nerves**, and select Fade Others. Observe their location and read their description.

2. These nerves are sensory/motor/mixed (circle one).

3. These nerves are responsible for the sense of ______.

4. Where do these nerves originate?

5. Where do these nerves terminate?

6. Select the cribriform plate.

a. Which cranial bone is this structure associated with?

b. The cribriform plate supports the ______ — the terminus of the ______ for the passage of the branches of the ______.

7. Identify the olfactory bulbs of CN 01:

a. Are **olfactory bulbs** seated superior or inferior to the cribriform plate?

b. Zoom in to see the projections on the inferior surface of the bulbs. (Tip: You may need to hide the ethmoid bone to see them well.)

c. Within each bulb, axons of olfactory ______ form synapses with dendrites and cell bodies of other _____.

8. According to the video of Module 21.6:

a. The olfactory receptors are associated with which specialized type of epithelium?

b. Which extracellular structures of this epithelium contain the actual nervous receptors?

9. Use Module 23.3, Olfactory Pathway, to identify the following structures associated with the sense of olfaction:

a. Olfactory nerves (CN 01)

- b. Olfactory bulbs
- c. Olfactory tracts of CN 01: Signals are transmitted along these tracts and end in the

_____ in the _____

- d. Cerebral cortex
- e. Hypothalamus
- f. Limbic system

10. If you are attempting to view the olfactory bulbs on a preserved specimen, they may be missing or incomplete. Why do you think this is?

11. Based on your learning, how do you think damage to this nerve would present clinically?

12. What types of tests would you devise to test the function of this nerve in patients?

<u>C. Identification of the Optic Nerves (II): Use Modules 21.7, 21.8, 23.17, and 23.18 to answer the following questions:</u>

Module 21.7



- 1. These nerves are sensory/motor/mixed (circle one).
- 2. Select the optic nerves, and select Fade Others. Observe their location, and read their description.
- 3. These nerves are responsible for the sense of ______.
- 4. According to the video of Module 21.8:

a. As light passes through the cornea and the pupil of the eye, it will focus on the ______, the layer of receptors that lines the inside of the eye.

b. If color and intensity of light originate as nerve signals, where are they finally interpreted?

5. Which bone contains the **optic foramina** that the optic nerves pass through? (Tip: Select and hide the eyes in order to visualize this bone.)

6. Using Module 23.17, identify the following structures:

- a. Optic nerves
- b. Optic chiasm
- c. Cerebral cortex

7. Return to Module 23.17: Choose the Multi Select tool and highlight both the right and left sides of the optic chiasm. Then, select the Fade Others tool and explore the location of the optic chiasm.

a. The optic chiasm is the crossing point of the optic nerves. Is it a partial or a complete crossing?

b. The crossed fibers occupy the medial/lateral (circle one) part of the chiasm.

- c. The uncrossed fibers occupy the medial/lateral (circle one) part of the chiasm.
- d. Where is the optic chiasm located in relation to the pituitary gland?

e. Where is the optic chiasm located in relation to the hypothalamus?

f. Posterior to the optic chiasm, fibers from the optic nerves travel in the form of optic _______to the ______.

8. Use Module 23.18, Optic Chiasm, to answer the following questions:

a. According to the Module 21.7, what is another term for "crossing over" of these nerve fibers?

b. Information from the left side of each eye's field of vision is transmitted to the ______ of the brain.

c. Information from the right side of each eye's field of vision is transmitted to the ______ of the brain.

d. Based on the anatomy of the optic chiasm, do you think the right cerebral hemisphere will process vision from the right eye, left eye, or both eyes?

e. How does the ability to have binocular vision benefit humans?

9. Based on your learning, how do you think damage to this nerve would present clinically?

10. What types of tests would you devise to test the function of this nerve in patients?

D. Identification of the Oculomotor Nerves (III), Trochlear Nerves (IV), and Abducens Nerves (VI): Use Modules 21.9, 21.10, and 21.15 to answer the following questions:

Module 21.9



<u>Module 21.10</u>



Module 21.15



- 1. These nerves are sensory/motor/mixed (circle one).
- 2. What is the common purpose of the oculomotor, trochlear, and abducens cranial nerves?
- 3. The oculomotor nerves:

a. Select the **oculomotor nerves**, and select Fade Others. Observe their location, and read their description.

b. Where do fibers of this nerve originate?

c. Which foramina do the oculomotor nerves pass through? Which cranial bone are these foramina associated with?

d. Be able to identify the following effector targets of the oculomotor nerves, along with their functions:

- i. Levator palpebrae superioris muscle:
- ii. Superior rectus muscle:

iii. Medial rectus muscle:

iv. Inferior rectus muscle:

v. Inferior oblique muscle:

vi. The oculomotor nerves cause the muscular ciliary body of each eye (see module 23.10) to accommodate the right and left lens for near vision. The nerves also activate the sphincter pupillae (not visible) of the iris (see module 23.10) to constrict the pupil.

4. The trochlear nerves:

a. Select the trochlear nerves, and select Fade Others. Observe their location, and read their description.

b. Where do fibers of this nerve originate?

c. Which foramina do the trochlear nerves pass through? Which cranial bone are these foramina associated with?

d. Which extraocular muscle is innervated by each trochlear nerve? What is its function?

5. The abducens nerves:

a. Select the abducens nerves, and select Fade Others. Observe their location, and read their description.

b. Where do fibers of this nerve originate?

c. Which foramina do the abducens nerves pass through? Which cranial bone are these foramina associated with?

d. Which extraocular muscle is innervated by each abducens nerve? What is its function?

e. What is the function of sensory fibers of the abducens nerves?

6. Based on your learning, how do you think damage to these nerves would present clinically?

7. What types of tests would you devise to test the function of these nerves in patients?

E. Identification of the Trigeminal Nerves (V): Use Modules 21.11, 21.12, 21.13, and 21.14 to answer <u>the following questions:</u>

Module 21.11



1. Select the **trigeminal nerves**, and select Fade Others. Observe their location, and read their description.

2. Observe the region of the trigeminal nerve closest to the brainstem. How does its size compare to that of the other nerves you've studied?

3. Each trigeminal nerve divides into ______ major branches.

4. Identify the **semilunar ganglion**.

5. The ophthalmic branch of the trigeminal nerve:

- a. This branch is sensory/motor/mixed (circle one).
- b. These sensory fibers originate from receptors associated with which regions:

c. As this branch transmits nerve impulses toward the brain, which cranial foramen does it pass through? Which cranial bone is this foramen associated with?

d. Which brain region do the fibers of this branch terminate on?

6. The maxillary branch of the trigeminal nerve:

- a. This branch is sensory/motor/mixed (circle one).
- b. These sensory fibers originate from receptors associated with which regions?
- c. Which foramen in the maxilla allows branches of this nerve to innervate the skin of the face?

d. Which foramen in the zygomatic bone allows branches of this nerve to innervate the skin of the face?

e. Select the maxilla and hide it. Observe the many branches off of the maxillary branch of the trigeminal nerve.

f. As this branch transmits nerve impulses toward the brain, which cranial foramen does it pass through? Which cranial bone is this foramen associated with?

g. Which brain region do the fibers of this branch terminate on?

7. The mandibular branch of the trigeminal nerve:

- a. This branch is sensory/motor/mixed (circle one).
- b. These sensory fibers originate from receptors associated with which regions?

c. These motor fibers terminate on which structures?

d. As this branch transmits nerve impulses to and from the brain, which cranial foramen does it pass through? Which cranial bone is this foramen associated with?

- 8. Based on your learning, how do you think damage to this nerve would present clinically?
- 9. What types of tests would you devise to test the function of this nerve in patients?



VISIBLE BODY®

Student Practice

Label the structures in the following figures.

Module 17.2 Nervous System Anatomy



Module 17.4 Peripheral Nervous System



Module 17.6 Special Sensory Organs



Module 20.2 Brain Regions



Module 21.2 Special Sensory Cranial Nerves



Module 21.3 Motor Cranial Nerves



Module 21.4 Mixed Cranial Nerves



Module 21.5 Olfactory Nerves (I)



Module 21.7 Optic Nerves (II)



Module 21.9 Oculomotor Nerves (III)



Module 21.10 Trochlear Nerves (IV)



Module 21.11 Trigeminal Nerves (V)



Module 21.15 Abducens Nerves (VI)

