

CRANIAL NERVES

OBJECTIVE/RATIONALE

Cranial nerves are an important part of the human nervous system. The student will identify the cranial nerves and the areas of the body they innervate, as well as the sensations that stimulate them.

TEKS 121.13 (c) 2b, 2d, 7a, 10a

TAKS ELA 1, 5

Science 1, 2

Writing 1, 2, 3, 4, 5, 6, 7

National Science Standards A9-12; C9-12; F9-12; G9-12

National Health Care Skills Standards .01, .02, .07

National Math Standards S1; S3

KEY POINTS

There are twelve pairs of cranial nerves that exit the brain and conduct impulses directly to areas of the head, neck and the thoracic and abdominal cavities.

- I. Olfactory
- II. Optic
- III. Oculomotor
- IV. Trochlear
- V. Trigeminal
- VI. Abducens
- VII. Facial
- VIII. Vestibulocochlear (Acoustic)
- IX. Glossopharyngeal
- X. Vagus
- XI. Accessory (Spinal Accessory)
- XII. Hypoglossal

ACTIVITIES

- I. Complete the Testing of Cranial Nerves Laboratory Investigation.

MATERIALS/RESOURCES

Two different items to smell. (The Smell test Kit from Carolina biological Company is recommended. Vials # 1 and # 8)

A newspaper or other printed material.

Penlight

Cotton ball

Ice

Cotton applicator
Sugar solution
Ticking watch
Unsweetened chocolate
Tongue depressor
Gloves
Goggles
Biohazard containers
Surface disinfectant
Paper towels

ASSESSMENT

Laboratory Investigation Rubric

ACCOMODATIONS

For reinforcement the student will create a pneumatic to learn the cranial nerves and a game to learn their function.

For enrichment, the student will prepare a case study on a disease or disorder that involves one or more of the cranial nerves. Present findings to the class.

REFLECTIONS

TESTING CRANIAL NERVES ACTIVITY SHEET

Purpose:

This activity is designed to help the student become familiar with the functions of the Cranial Nerves. Perform each test on your lab partner. Carefully observe and record the results of each test. (Do not perform a test if a medical condition is present that may be exacerbated by the test.)

Background:

Materials:

Two different items to smell. (The Smell test Kit from Carolina biological Company is recommended. Vials # 1 and # 8)

A newspaper or other printed material.

Penlight

Cotton ball

Ice

Cotton applicator

Sugar solution

Ticking watch

Unsweetened chocolate

Tongue depressor

Gloves

Goggles

Biohazard containers

Surface disinfectant

Paper towels

Procedure:

1. Preparation

Wash hands and put on gloves and goggles.

Assemble equipment and materials.

Prepare work area.

2. Olfactory I

Equipment: At least two different items to smell.

Procedure: Have your lab partner close both eyes and plug one nostril.

Hold a familiar smell under the open nostril and ask him/her to identify it. Test the other nostril with a different smell.

3. Optic II

Equipment: Newspaper or other printed material.

Procedure: Ask your lab partner to cover one eye. Hold the printed material approximately 18 inches away and have them read two sentences. Repeat the procedure using the other eye.

Peripheral vision is tested as you stand or sit two feet in front of your lab partner. Your eyes should be at the same level as theirs. Ask your partner to cover their right eye. You should cover your left eye. (Your field of vision should be similar.) Extend your right arm to the side, raise your forefinger and position it about the same distance from your face and your partner's. Your partner should let you know when he/she sees your finger. Now, wiggle your finger and slowly move it inward. Your lab partner should see your finger about the same way you do.

4. Oculomotor III, Trochlear IV, and Abducens VI

(These Nerves are usually tested together.)

Equipment: Penlight

Procedure: To check for extraocular muscle movement, hold your forefinger about 18 inches away from your partner's eyes. Ask your partner to follow your finger with his/her eyes as you draw the letter "H". Your partner's eyes should move together as they follow your finger with their eyes. Their head should not move.

Shine the penlight into your partner's eye from approximately 8 inches away. Pupil should constrict immediately. Repeat with other eye.

5. Trigeminal V

Equipment: Cotton ball, ice, two different smells

Procedure: To evaluate the strength and symmetry of the temporal muscles, put your fingertips on your lab partner's temples and ask him/her to clench his/her teeth. To assess the masseter muscles, place your fingertips on his/her jaw and ask them to clench their teeth. The muscles should feel strong and even on both sides of their head and face.

To test for the sensory function (ophthalmic, maxillary, and mandibular sensations). First have your partner close both eyes. Lightly touch his/her forehead, cheek, and jaw, on both sides of the face, using a cotton ball. Have them tell you when they feel the cotton touching them. Second, take a

small piece of ice and apply it **briefly** to a maxillary and a mandibular incisor.

Have your partner close their eyes and take three strong sniffs from two different items. Your partner should explain how they are different or how they are the same. (Some chemicals produce a cooling or irritating sensation in the nasal cavity by stimulating the Trigeminal nerve.)

6. Facial VII

Equipment: Cotton applicator and sugar solution

Procedure: Assess the taste buds by touching a cotton applicator dipped in a sugar solution on to the tongue of your lab partner. Have them tell you where on the tongue they taste the sugar.

To test the motor control of the muscles of facial expression, have your partner raise their eyebrows, frown, smile and puff out their cheeks. Also, have your partner tightly close their eyes and resist your attempts to (gently) open them.

7. Vestibulocochlear VIII

Equipment: Ticking watch

Procedure: To test for hearing, stand 2 feet slightly behind your partner's right side. Whisper several numbers and see if they can repeat them. Hold a ticking watch and have your partner tell you when he/she can hear it. (Repeat the test on the left side.)

To test the balance portion of this nerve, have the person spin around 10 times. Watch the response of their eyes. A normal response to the spinning movement is vertigo. (A sense that the subject is dizzy or that the room is moving.) Do NOT permit your partner to fall or to walk until the dizziness is completely gone!

8. Glossopharyngeal IX (Sensory function)

Equipment: Unsweetened chocolate, cotton applicator

Procedure: Place the bitter tasting chocolate on the tip, sides, and back of your lab partner's tongue. Have him/her let you know when they taste it.

9. Glossopharyngeal IX (Motor function), Vagus X

Equipment: Cotton applicator and tongue depressor

Procedure: Place your hand on your lab partner's throat and ask him/her to swallow. Check the gag reflex by gently touching the back of their throat with a cotton swab. (Hold down the tongue with the tongue depressor. Explain what happens. Touch the

uvula with a cotton swab slowly and gently. Describe what happens. Gently hold down the tongue with a tongue depressor and have your partner say “ah”. Describe the movement of the uvula, if any.

10. Accessory XI

Equipment: None

Procedure: To test the strength of the sternocleidomastoid muscle by placing your hand against your partner’s cheek and having them turn their head as you apply resistance. Note the force they are able to apply against your hand.

To assess the strength of the trapezius muscle, place your hands on your partner’s shoulders and have him/her shrug their shoulders as you apply resistance. Is the muscular strength equal on both sides?

11. Hypoglossal XII

Equipment: Tongue depressor

Procedure: Have your lab partner stick out their tongue. Note any deviations from the midline. Ask your partner to move their tongue from side to side while you use the tongue depressor to prevent the movement. Note any lack of strength.

Data:

Complete the table on cranial nerve testing.

CRANIAL NERVE	AREA STIMULATED	OBSERVED RESPONSE
I. Olfactory		
II. Optic		
III. Oculomotor		
IV. Trochlear		
V. Trigeminal		
VI. Abducens		
VII. Facial		
VIII. Vestibulocochlear		

IX. Glossopharyngeal		
X. Vagus		
XI. Accessory		
XII. Hypoglossa.		

Conclusion:

1. Based on the results of your testing, what can you conclude about the importance of cranial nerves in everyday life?

2. Indicate the cranial nerve/s most closely associated with each of the following functions:
 - a. Sense of hearing
 - b. Sense of smell
 - c. Sense of sight
 - d. Sense of sweet taste
 - e. Sense of bitter taste
 - f. Sense of equilibrium
 - g. Sensory impulses from the upper teeth
 - h. Sensory impulses from the lower teeth
 - i. Raising the eyelids
 - j. Focusing the lenses of the eyes
 - k. Adjusting the amount of light entering the eyes
 - l. Moving the eyes
 - m. Stimulating salivary secretions

- n. Smiling
 - o. Shrugging the shoulders
 - p. Turning the head from side to side
 - q. Tongue movements associated with swallowing
 - r. Tongue movements associated with talking
3. Destruction or impairment of which cranial nerve or nerves would cause the following conditions:
- a. Blindness
 - b. Inability to lick the lips
 - c. Anosmia
 - d. Deafness
 - e. Inability to move the eyeball
 - f. Inability to open the eyelid
 - g. Inability to frown
 - h. Inability to taste bitter substances
 - i. Inability to turn the head
 - j. Loss of balance
 - k. Inability to focus the lens of the eye
 - l. Paralysis of one side of the face