



**University of Kerbala / College of Nursing**  
**Adult Nursing Department**  
**Health Assessment I**  
**Assessment of Neurologic System**



The nervous system controls body functions through voluntary and autonomic responses to external and internal stimuli. Structural divisions of the nervous system are the central nervous system (CNS), which consists of the brain and spinal cord; the peripheral nervous system; and the autonomic nervous system (ANS).

### CENTRAL NERVOUS SYSTEM: Protective Structures

The skull protects the brain. At the base of the skull in the occipital bone is a large oval opening termed the **foramen magnum**, through which the spinal cord extends from the medulla oblongata. There are other openings (foramina) at this base for the entrance and exit of paired cranial nerves and cerebral blood vessels.

### Cerebrospinal Fluid and Cerebral: Ventricular System

Cerebrospinal fluid (CSF) is a colorless, odorless fluid containing glucose, electrolytes, oxygen, water, carbon dioxide, protein, and leukocytes. It circulates around the brain and spinal cord to provide a cushion, maintain normal intracranial pressure, provide nutrition, and remove metabolic wastes.

The cerebral ventricular system consists of four interconnecting chambers or ventricles that produce and circulate CSF (see Fig. 1). There is one lateral ventricle in each hemisphere, with a third ventricle adjacent to the thalamus and a fourth adjacent to the brainstem.

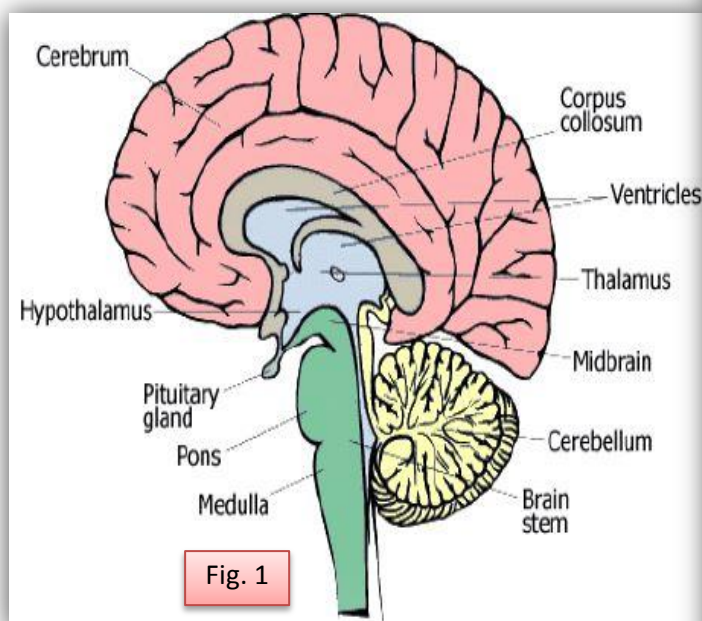


Fig. 1

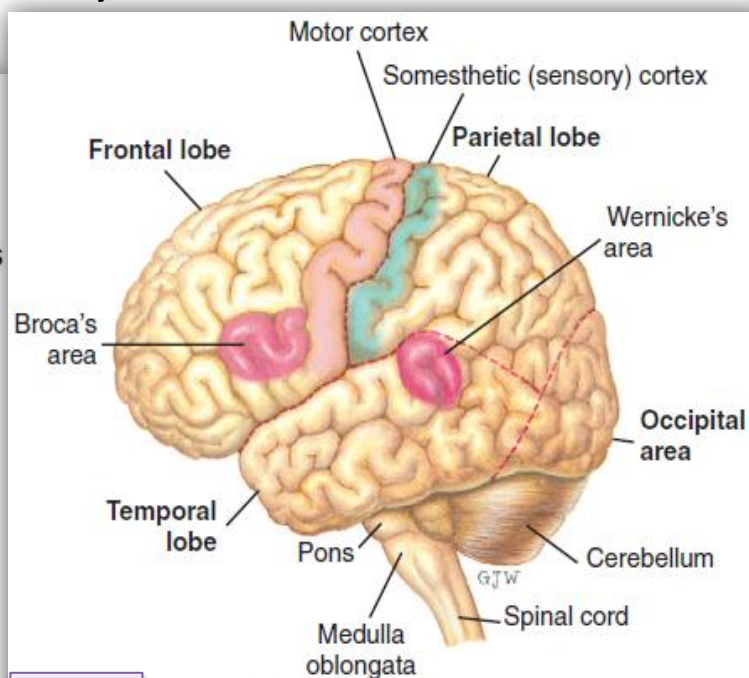


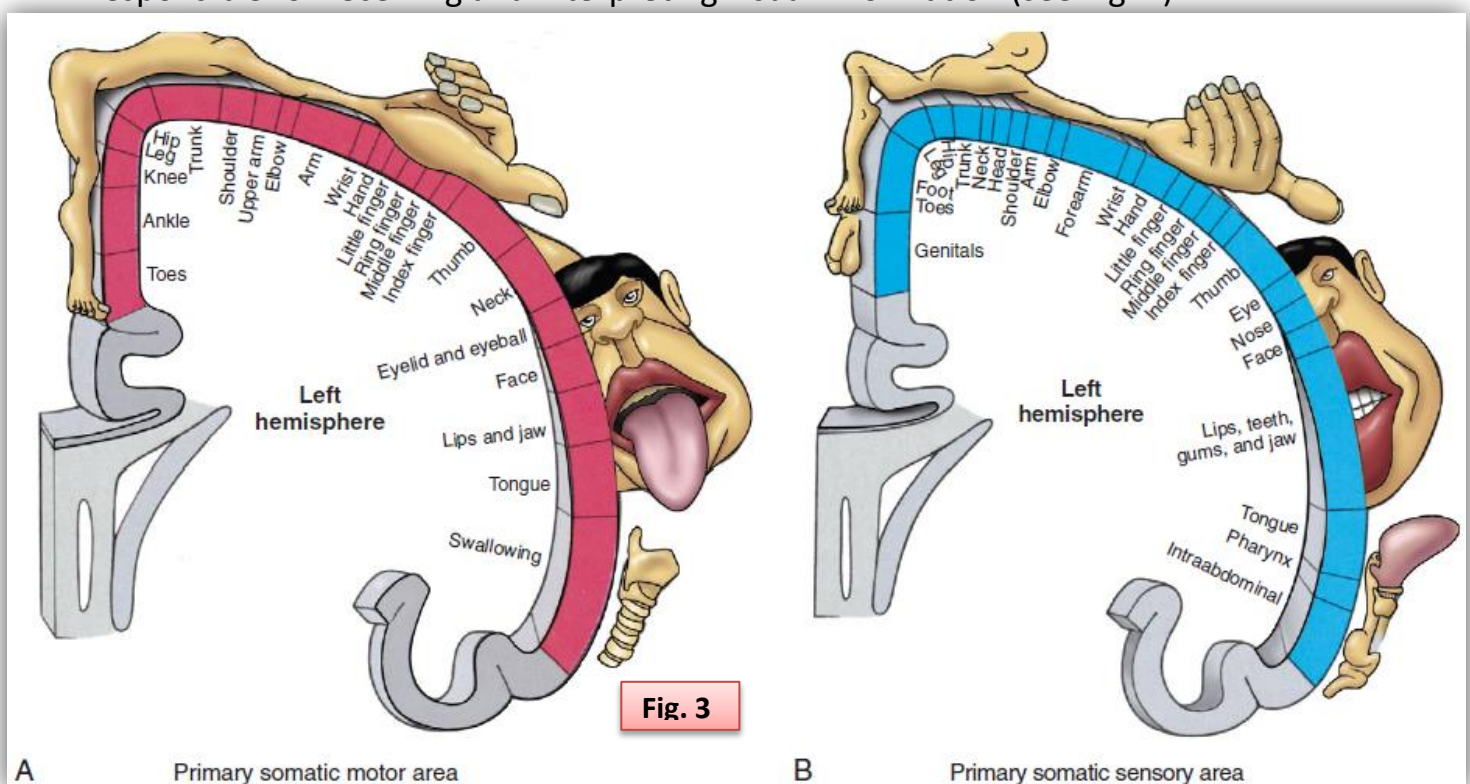
Fig. 2

Cerebral hemispheres. Lateral view of the brain.

**Brain:** The brain, consisting of the cerebrum, diencephalon, cerebellum, and brainstem, is made up of gray matter (cell bodies) and white matter (myelinated nerve fibers). The carotid arteries supply most of the blood to the brain and branch off into the posterior cerebral, middle cerebral, and anterior cerebral arteries (see Figs.1 And 2).

**Cerebrum:** The cerebrum is the largest part of the brain and is composed of two hemispheres. Each hemisphere is divided into four lobes: frontal, parietal, temporal, and occipital (Fig. 2).

The **frontal lobe** contains the primary motor cortex and is responsible for functions related to voluntary motor activity. The distribution of the nerves that provide movement to specific parts of the body is shown in (Fig. 3, A). The left frontal lobe contains Broca's area (see Fig. 2), which is involved in formulation of words. The frontal lobe also controls intellectual function, awareness of self, personality, and autonomic responses related to emotion. The **parietal lobe** contains the primary somesthetic (sensory) cortex. One of its major functions is to receive sensory input such as position sense, touch, shape, and texture of objects. The distribution of the nerves that receive sensations from specific parts of the body is adjacent to the motor cortex and is shown in (Fig. 3, B). The **temporal lobe** contains the primary auditory cortex. Wernicke's area (see Fig. 2), located in the left temporal lobe, is responsible for comprehension of spoken and written language. The temporal lobe also interprets auditory, visual, and somatic sensory inputs that are stored in thought and memory. The **occipital lobe** contains the primary visual cortex and is responsible for receiving and interpreting visual information (see Fig. 2).



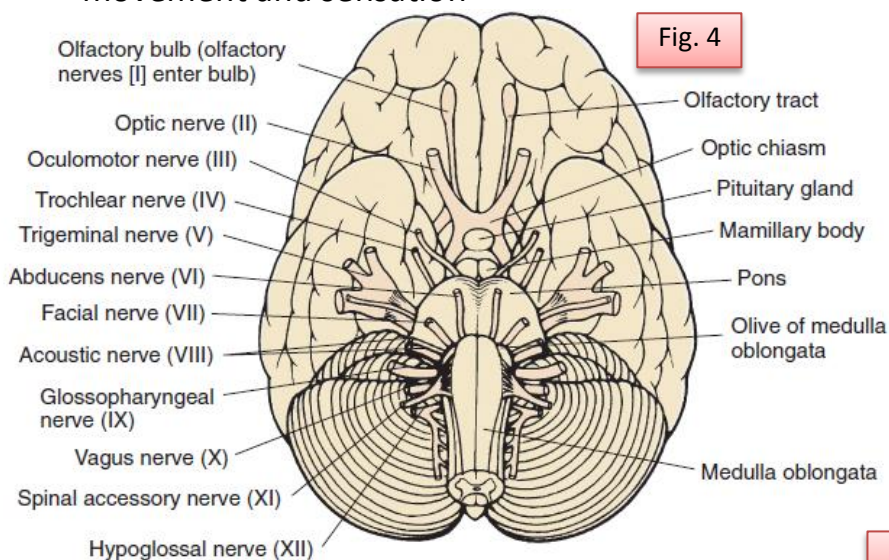


**Diencephalon:** The thalamus, hypothalamus, epithalamus, and subthalamus make up the diencephalon. The **thalamus** is a relay and integration station from the spinal cord to the cerebral cortex and other parts of the brain. The **hypothalamus** has several important functions in maintaining homeostasis. Some of these functions include regulation of body temperature, hunger, and thirst; formation of ANS responses; and storage and secretion of hormones from the pituitary gland. The **epithalamus** contains the pineal gland, which causes sleepiness and helps regulate some endocrine function. The subthalamus is part of the basal ganglia.

**Basal Ganglia:** Between the cerebral cortex and midbrain and adjacent to the diencephalon lie the structures that form the basal ganglia. The function of the basal ganglia is to create smooth, coordinated voluntary movement by balancing the production of two neurotransmitters: **acetylcholine and dopamine**.

**Brainstem:** The midbrain, pons, and medulla oblongata make up the brainstem. Ten of the twelve cranial nerves originate from the brainstem (Fig. 4). The major function of the midbrain is to relay stimuli concerning muscle movement to other brain structures. It contains part of the motor tract pathways that control reflex motor movements in response to visual and auditory stimuli. The oculomotor nerve (CN III) and trochlear nerve (CN IV) originate in the **midbrain**. The pons relays impulses to the brain centers and lower spinal nerves. The cranial nerves that originate in the **pons** are trigeminal (CN V), abducens (CN VI), facial (CN VII), and acoustic (CN VIII) see (Table1 & 2).

The **medulla oblongata** contains reflex centers for controlling involuntary functions such as breathing, sneezing, swallowing, coughing, vomiting, and vasoconstriction. Motor and sensory tracts from the frontal and parietal lobes cross from one side to the other in the medulla, so lesions on the right side of the brain create abnormal movement and sensation



Inferior surface of the brain showing the origin of the cranial nerves.

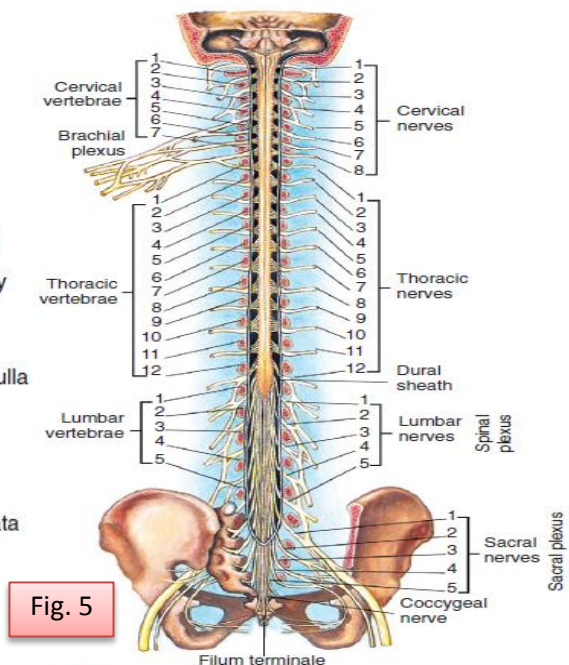


FIG. 15-6 View of the spinal column showing vertebrae.

**TABLE 15-1 THE CRANIAL NERVES AND THEIR FUNCTIONS**

CRANIAL NERVE	FUNCTION
Olfactory (I)	Sensory: Smell reception and interpretation
Optic (II)	Sensory: Visual acuity and visual fields
Oculomotor (III)	Motor: Raise eyelids, most extraocular movements Parasympathetic: Pupillary constriction, change lens shape
Trochlear (IV)	Motor: Downward, inward eye movement
Trigeminal (V)	Motor: Jaw opening and clenching, chewing and mastication Sensory: Sensation to cornea, iris, lacrimal glands, conjunctiva, eyelids, forehead, nose, nasal and mouth mucosa, teeth, tongue, ear, facial skin
Abducens (VI)	Motor: Lateral eye movement
Facial (VII)	Motor: Movement of facial expression muscles except jaw, close eyes, labial speech sounds (b, m, w, and rounded vowels) Sensory: Taste—anterior two thirds of tongue, sensation to pharynx Parasympathetic: Secretion of saliva and tears
Acoustic or vestibulocochlear (VIII)	Sensory: Hearing and equilibrium
Glossopharyngeal (IX)	Motor: Voluntary muscles for swallowing and phonation Sensory: Sensation of nasopharynx, gag reflex, taste—posterior one third of tongue Parasympathetic: Secretion of salivary glands, carotid reflex
Vagus (X)	Motor: Voluntary muscles of phonation (guttural speech sounds) and swallowing Sensory: Sensation behind ear and part of external ear canal Parasympathetic: Secretion of digestive enzymes; peristalsis; carotid reflex; involuntary action of heart, lungs, and digestive tract
Spinal accessory (XI)	Motor: Turn head, shrug shoulders, some actions for phonation
Hypoglossal (XII)	Motor: Tongue movement for speech sound articulation (l, t, n) and swallowing

**Table 2 HOW TO REMEMBER NAMES AND NERVE TYPE OF CRANIAL NERVES**

Read the words in the column on the left from top to bottom. The first letter of each word is the same as the first letter in the name of the cranial nerve (CN). The fourth column gives the type of impulses carried by the nerves (i.e., sensory, motor, or both sensory and motor). The last column is a phrase to remember the type of nerve for each cranial nerve.

MEMORY WORD	CN NUMBER	CN NAME	TYPE	MEMORY WORD
On	CN I	Olfactory	Sensory	Some
Old	CN II	Optic	Sensory	Say
Olympus	CN III	Oculomotor	Motor	Marry
Towering	CN IV	Trochlear	Motor	Money
Top	CN V	Trigeminal	Both	But
A	CN VI	Abducens	Motor	My
Fin	CN VII	Facial	Both	Brother
And	CN VIII	Acoustic (vestibulocochlear)	Sensory	Says
German	CN IX	Glossopharyngeal	Both	Bad
Viewed	CN X	Vagus	Both	Business to
Some	CN XI	Spinal accessory	Motor	Marry
Hops	CN XII	Hypoglossal	Motor	Money



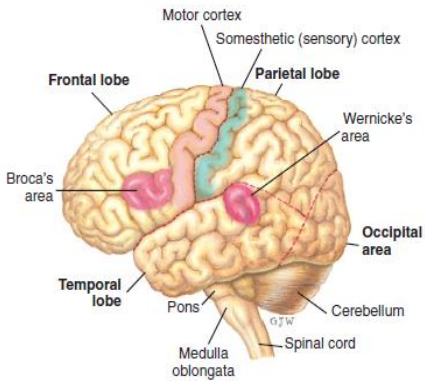
**AUTONOMIC NERVOUS SYSTEM:** The ANS regulates the internal environment of the body in conjunction with the endocrine system. It has two components: the **sympathetic** nervous system (SNS) and the **parasympathetic** nervous system (PNS). The **SNS** arises from the thoracolumbar segments of the spinal cord and is activated during stress (the fight-or-flight response). The **SNS actions** include increasing blood pressure and heart rate, vasoconstriction peripheral blood vessels, inhibiting gastrointestinal peristalsis, and dilating bronchi. By contrast, the **PNS** arises from craniosacral segments of the spinal cord and controls vegetative functions (breed and feed). The **PNS actions** are involved in functions associated with conserving energy such as decreasing heart rate and force of myocardial contraction, decreasing blood pressure and respiration, and stimulating gastrointestinal peristalsis.

### **GENERAL HEALTH HISTORY**

- 1- **Present Health Status:**
- 2- **Past Health History:** (medical & surgical)
- 3- **Family History:**
- 4- **Personal and Psychosocial History:**

### **Physical examination (Neurological)**

Nurses interview patients to collect subjective data about their present health and any past medical experiences. They ask questions about the patient's present health status, past health history, family history, and personal and psychosocial history, which may affect the functions of the nervous system. Quality Improvement Competencies for Nurses include providing patient-centered care and interdisciplinary teamwork with physical and occupational therapists and vocational counselors.

Physical Exam	Normal finding	Abnormal finding
<b>ASSESS mental status and level of consciousness:</b> Say the patient's name and note the response. The patient is expected to turn toward you and respond appropriately.  The patient should be oriented to time, place and person.		Do not know their name or location is disoriented. Those who require excessive stimulation or even painful stimuli.

**Carnal Nerve Assessment**

See (Table 1) for CN. Function and Test

**1- Olfactory nerve (CN I)**

Ask patient to close eyes. Occlude one naris, hold vial (using least irritating aromatic substances first [e.g., orange or peppermint extract]) under nose, and ask patient to breathe deeply and identify odor. Allow patient to breathe comfortably, then occlude other naris and repeat with different odor. Continue, alternating two or three odors.

**2- Optic nerve (CN II):**

See Tests for near and distance visual acuity and visual fields and color.

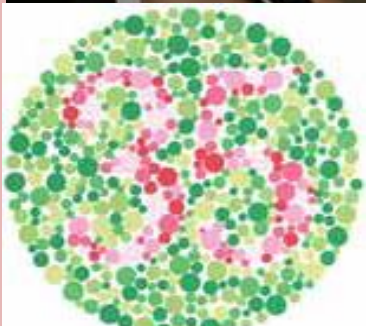
**3- Oculomotor, trochlear, abducens nerves (CN III, CN IV, CN VI):**

See tests for six cardinal points of gaze, pupil size, shape, response to light and accommodation, and opening of upper eyelids

1-Able to perceive and usually identify odor on each side.

2-Vision 20/20 without or with lenses each eye; full visual fields.

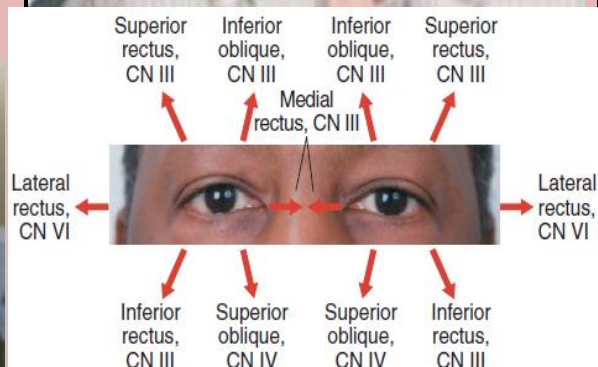
3-Equal pupil size, equal and consensual response to light and accommodation, symmetric eye movements in all six cardinal points of gaze.



1-Anosmia, loss of smell or inability to discriminate odors.

2-vision problem or loss.

3- Absence of lateral gaze. Absence of any expected finding, ptosis.

**4-Trigeminal nerve(CN V)**

**A- Facial muscle tone**  
Inspect face for symmetry or muscle twitching. Ask patient to clench teeth tightly as you **palpate** muscles over jaw.

**B- Sensation:** Ask patient to close eyes and report if sensation to touch is sharp or dull as you touch

4-A-Symmetric tone.

4-B-Symmetric discrimination of sensations in each location to all stimuli.



4-A-Muscle atrophy, deviation of jaw to one side, or fasciculation.

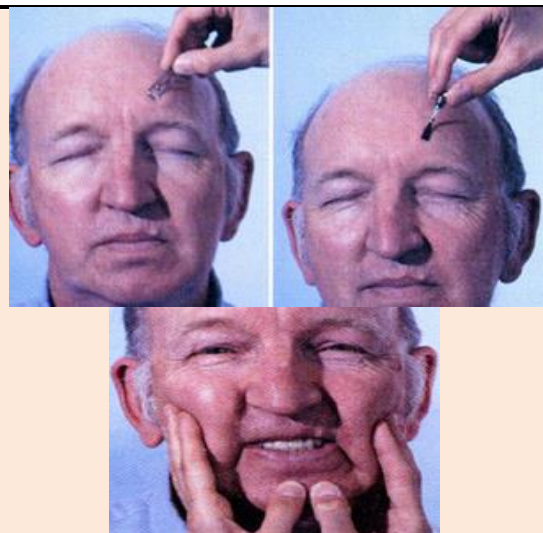
4-B- Impaired sensation with identified distribution. If impaired, use test tubes of hot and cold water to evaluate temperature sensation.

4-C- **Normally** Symmetric blink reflex. May be diminished or absent if patient wears contact lenses.



each side of face at scalp, cheek, and chin areas, alternately using sharp and rounded edges of tongue blade or paper clip in an unpredictable pattern. Ask patient to report when the stimulus is felt as you stroke same six areas with cotton wisp or brush. Finally,

4-C-Test corneal reflex with cotton wisp.



### 5- facial nerve (CN VII):

#### A-facial Expressions

Assess motor function by asking patient to make the following facial expressions:

- Raise eyebrows and wrinkle forehead
- Smile,
- Frown
- Puff out cheeks
- Purse lips and blow out
- Show teeth
- Squeeze eyes shut against resistance

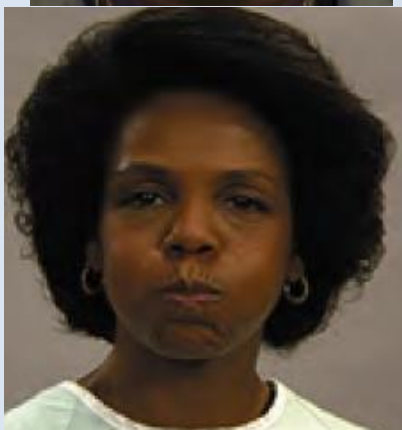
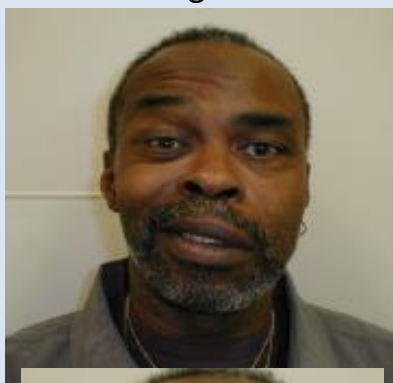
**B- Speech:** Listen to articulation and clarity of speech.

#### C- Taste (CN VII and CN IX):

Hold card listing tastes in patient's view. Ask patient to extend tongue. Apply one of four solutions to lateral side of tongue in appropriate taste-bud region. Ask patient to point to taste perceived. Offer patient a sip of water, and repeat with different solution and applicator, testing each side of tongue with each solution.

5- A-Facial symmetry.

5-C- Able to identify sweet, salty, sour, bitter taste bilaterally when placed in appropriate taste-bud region.



5-A-Tics, unusual facial movements, or asymmetry of expression (flattened nasolabial fold, lower eyelid sagging, side of mouth drooping).






5-B- Difficulty with enunciation of *b*, *m*, and *p* (labial sounds).



CN. (IX)  
(posterior  
one third)

CN. (VII)  
(anterior  
two thirds)



<p><b>6-Acoustic nerve (CN VIII)</b></p> <ul style="list-style-type: none"> <li>• <b>Hearing Acuity</b></li> </ul> <p>A-Whispered Test (voice):</p> <p>B-Weber test:</p> <p>C-Rinne test:</p> <ul style="list-style-type: none"> <li>• <b>Balance:</b></li> </ul> <p>(Romberg test)</p>	<p>• Adequate hearing bilaterally.</p> 	
<p><b>7-Glossopharyngeal nerve (CN IX):</b></p> <ul style="list-style-type: none"> <li>• Taste See CN VII.</li> <li>• Gag reflex (nasopharyngeal sensation) See CN X.</li> </ul>		
<p><b>8-Vagus nerve (CN X):</b></p> <p><b>A-Motor function</b></p> <p>Ask patient to say "aah" while observing movement of palate and uvula.</p> <p><b>B-Gag reflex</b> (nasopharyngeal sensation; CN IX and X): ((Tell patient you will be testing gag reflex. Touch posterior wall of pharynx with applicator while observing palate, pharyngeal muscles, and uvula)).</p> <p><b>C-Swallowing</b> (CN IX and X) Ask patient to swallow water.</p> <p><b>D-Speech:</b></p>	<p>A-Soft palate rises with uvula in midline.</p> <p>B-Upward movement of palate and contraction of pharyngeal muscles, with uvula in midline.</p> <p>C- Water easily swallowed.</p> 	<p>A- Failure of soft palate to rise or uvula deviates from midline</p> <p>B- Drooping or absence of arch on either side of soft palate; uvula deviates from midline.</p> <p>C- Retrograde passage of water through nose.</p> <p>D- Hoarseness, nasal quality, or difficulty with guttural sounds.</p> 
<p><b>9- Spinal accessory nerve (CN XI):</b> See musculoskeletal system assessment: size, shape, strength of trapezius and sternocleidomastoid muscles.</p>	<ul style="list-style-type: none"> <li>• Symmetric size, shape, and strength.</li> </ul>	



**10-hypoglossal nerve (CN XII)**

**A-Tongue** resting and protruded Inspect while at rest on floor of mouth and while protruded.

**B-Tongue movement**

Ask patient to move tongue in and out, side to side, curled up toward nose, curled down toward chin.

**C-Tongue strength**

Ask patient to push tongue against cheek while you apply resistance with index finger.

**D-Speech**

A-Tongue midline, symmetric size.

B-Able to perform most tongue movements.

C- Steady, firm pressure.



A-Fasciculations, asymmetry, atrophy, or deviation from midline.

D- Problems with l, t, d, or n (lingual sounds).

**Proprioception and Cerebellar Function (Evaluate coordination and fine motor skills)**

Have patient sit. (this tests for muscle and cerebellar assessment)

**1-Rapid, rhythmic, alternating movements:**

ask the patient to touch the thumb to each finger of the same hand sequentially from index finger to little finger and back, one hand at a time.

**2-Accuracy of movement: (Finger-to nose)**

**Test** Position your index finger 40–50 cm from patient. Ask patient to touch his or her nose and your index finger with the index finger of one hand, as shown. Change location of your index finger several times.

1-Smooth execution, maintaining rhythm with increasing speed.

2-Movements rapid, smooth, accurate.



1- Stiff, slowed, non-rhythmic, or jerky clonic movements.

2-Consistent past pointing (missing examiner's index finger).



Repeat with patient's other hand.

\*Alternatively ask the patient to close both eyes and touch his or her nose with index finger of each hand while alternating hands and gradually increasing speed.

### 3-Evaluate balance

#### A-Balance: *Romberg test*

Ask patient to stand with feet together and arms at sides, with eyes first open, then closed. (**Stand close by in case patient starts to fall**).

#### B- Balance: *Standing and hopping*

Have patient (eyes closed) stand in place on one foot, then the other. Then have patient (with eyes open) hop on each foot.

#### C- Gait: *Walking:*

Ask patient to walk without shoes around examining room or down hallway, with eyes open, then closed.

Then Ask patient (arms at side and eyes open) to walk a straight line, first forward and then backward. Ask patient to touch toe of one foot with heel of other.

3-A-Slight swaying movement, no danger of falling.

3-B- Able to stand and hop on each foot for 5 seconds without losing balance.

3-C- Smooth, regular gait rhythm and symmetric stride length; upright trunk posture swaying with gait phase; and arm swing smooth and symmetric.



3-A- Staggering, losing balance, or swaying to the extent of falling.

3-B- Instability, need to continually touch floor with opposite foot, or tendency to fall.

3-C-Shuffling, widely placed feet, toe walking, foot flop, leg lag, scissoring, loss of arm swing, staggering, lurching, or waddling motion.

