

# NEUROLOGICAL EXAMINATION

## Components of a CNS EXAMINATION

- Higher mental functions
- Cranial Nerves
- Motor system examination – bulk, tone, power
- Reflexes.
- Coordination – fine movements, balance and gait.
- Sensory system examination.

# Higher mental functions

- The mental status examination is a structured assessment of the patient's behavioural and cognitive functioning.
- The specific cognitive functions of alertness, language, memory, constructional ability, and abstract reasoning are the most clinically relevant.
- It should be a requisite part of standard neurologic examination – at least Mini Mental State Examination should be performed in neurologic patients.

## Appearance and General Behavior

- ▶ These variables give the examiner an overall impression of the patient.
- ▶ The patient's physical appearance (apparent vs. stated age), grooming (immaculate/unkept), dress (subdued/riotous), posture (erect/kyphotic), and eye contact (direct/furtive) are all pertinent observations aiding the diagnosis.
- ▶ Certain specific syndromes such as unilateral spatial neglect and the disinhibited behavior of the frontal lobe syndrome are readily appreciated through observation of behaviour alone.

## Structured Examination of Cognitive Abilities

- Performing a mini-mental status examination.
- Or a using a Mental status questionnaire.
- These measures only give a *snapshot of patients cognition*.

## Mini mental state examination

- ▶ MMSE is a 30 point scoring system and is one of the most widely used brief screening systems for cognitive state.
- ▶ Components include:
  - i. Orientation
  - ii. Registration
  - iii. Attention and Calculation
  - iv. Recall
  - V. Language

## 1.Orientation ( total 10 points )

- ▶ What is the orientation to time? time ( 1 point) date ( 1 point)  
day ( 1 point) Month ( 1 point) year( 1 point) –  
A total of 5 points.
- ▶ What is the name of this: (orientation to place) Ward ( 1 point)  
hospital ( 1 point) district ( 1 point) town ( 1 point) country ( 1 point)  
A total of 5 points.

## 2. Registration ( 3POINTS )

- ▶ Name any three objects
- ▶ Score 1, 2, 3 points according to how many the patient repeats.
- ▶ Re-submit the list until the patient is word perfect in order to use this for a later test of recall
- ▶ Score only for first attempt 3 points

### 3. Attention and calculation

- ▶ Have the patient subtract 7 from 100 and then from
- ▶ the result a total of five times.
- ▶ Score 1 point for each correct subtraction 5 points

### 4. Recall ( 3points)

- ▶ Ask for three objects used in the registration test.
- ▶ one point being awarded for each correct answer.
- ▶ A total of 3 points avoided per correct recall.

## 5. Language and Intelligence (9 points)

- ▶ 1 point each for two objects correctly named (pencil and watch) 2 points.
- ▶ 1 point for correct repetition (No ifs and buts) 1 point.
- ▶ 3 points if three-stage commands correctly obeyed  
    'Take this piece of paper in your right hand, fold it in half, and  
    place it on the floor'. 3 points.
- ▶ 1 point for correct response to a written command such as 'close your eyes'.  
    1 point.


- ▶ Have the patient write a sentence. Award 1 point if the sentence is  
    meaningful, has a verb and a subject. 1 point
- ▶ Test the patient's ability to copy a complex diagram of two intersected  
    pentagons. 1 point

- ▶ Total score is 30. Maximum score of 30 is normal.
- ▶ Scores between 15 and 22 suggest mild to moderate dementia.
- ▶ Scores lower than 21 are associated with severe cognitive impairment

## Mini-Mental State Examination (MMSE)

Patient's Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Instructions: Ask the questions in the order listed.**  
**Score one point for each correct response within each question or activity.**

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials: _____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, ...) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.)
		
30		<b>TOTAL</b>

## THE SHORT PORTABLE MENTAL STATUS QUESTIONNAIRE

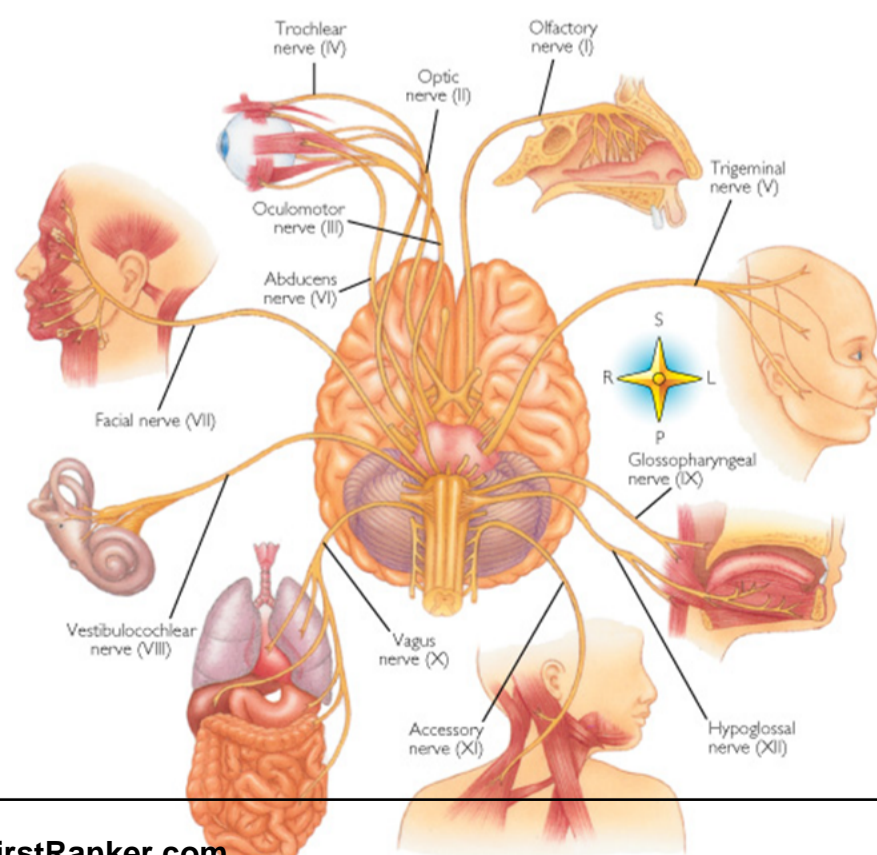
- 1. What are the date, month, and year?
  - 2. What is the day of the week?
  - 3. What is the name of this place?
  - 4. What is your phone number?
  - 5. How old are you?
  - 6. When were you born?
  - 7. Who is the current president?
  - 8. Who was the president before him?
  - 9. What was your mother's maiden name?
  - 10. Can you count backward from 20 by 3's?
- 
- **SCORING:\***
  - 0-2 errors: normal mental functioning
  - 3-4 errors: mild cognitive impairment
  - 5-7 errors: moderate cognitive impairment
  - 8 or more errors: severe cognitive impairment
  - \*One more error is allowed in the scoring if a patient has had a grade school education or less.
  - \*One less error is allowed if the patient has had education beyond the high school level.
  - Source: Pfeiffer, E. (1975). A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *Journal of American Geriatrics Society*, 23, 433-41.

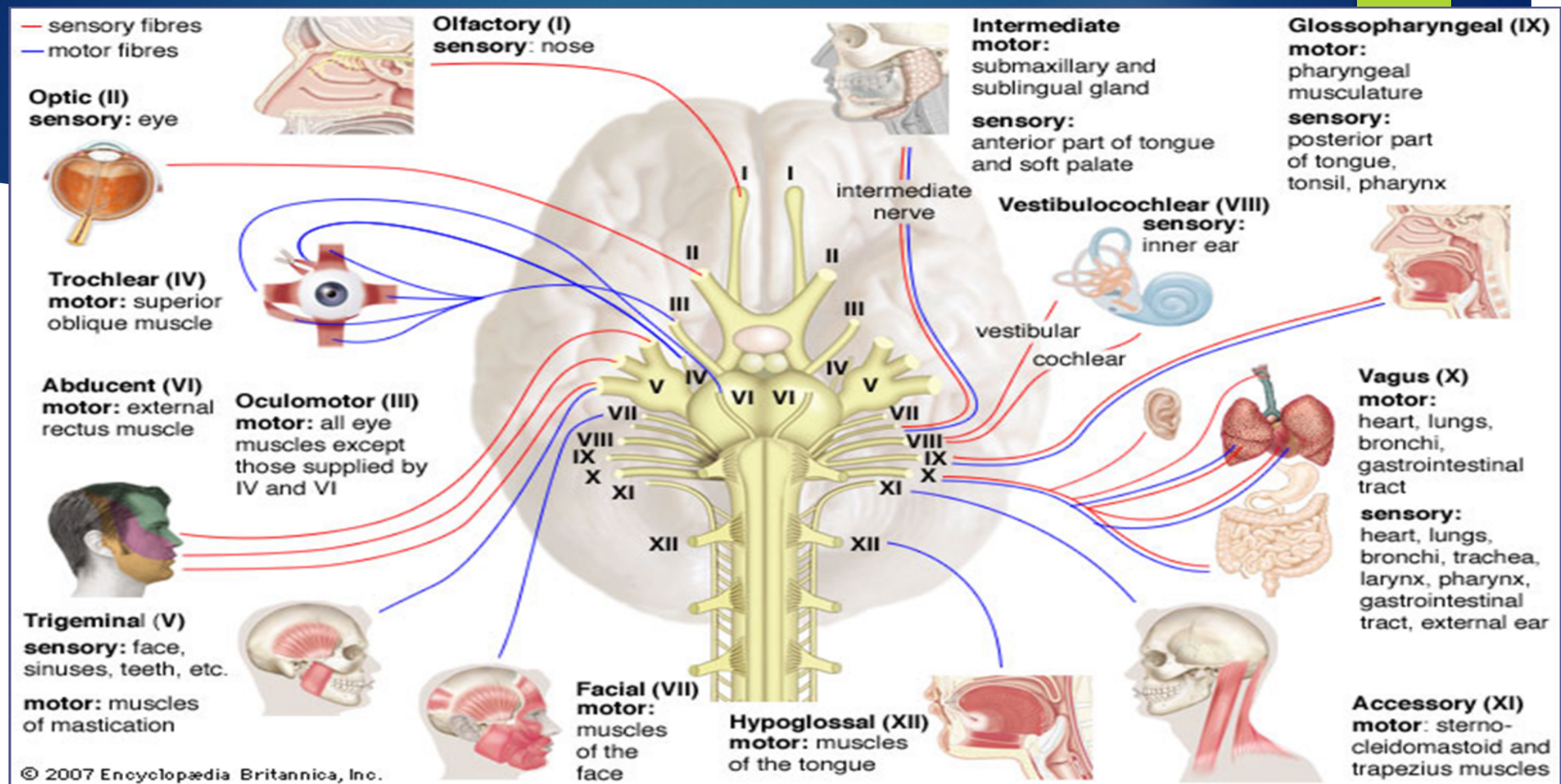
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## CRANIAL NERVE EXAMINATION

### ► 12 pairs of cranial nerves:

- CN1 Olfactory
- CN2 Optic
- CN3 Oculomotor
- CN4 Trochlear
- CN5 Trigeminal
- CN6 Abducens
- CN7 Facial
- CN8 Vestibulocochlear
- CN9 Glossopharyngeal
- CN10 Vagus
- CN11 Spinal Accessory nerve
- CN12 Hypoglossal



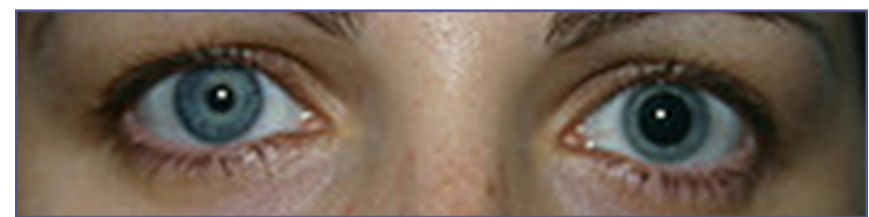
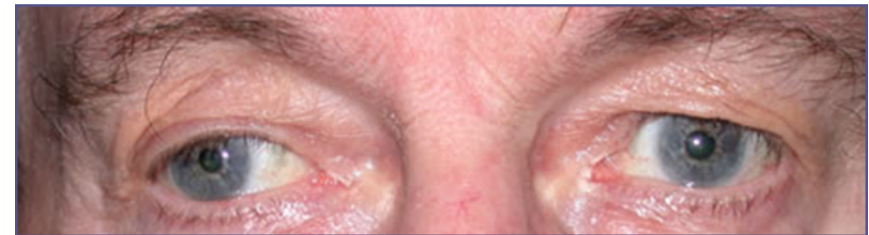


## On broad inspection

- Look for facial asymmetry

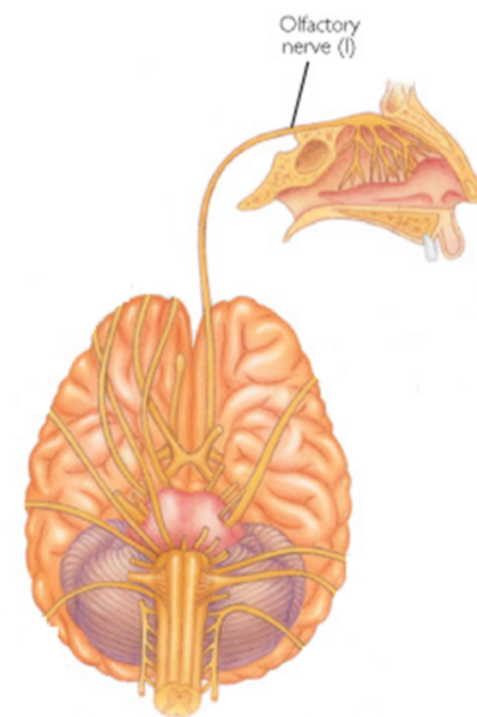


- ▶ Look for ocular deviation , Ptosis or Unequal pupils ( Anisocoria )



## CN1 – Olfactory nerve

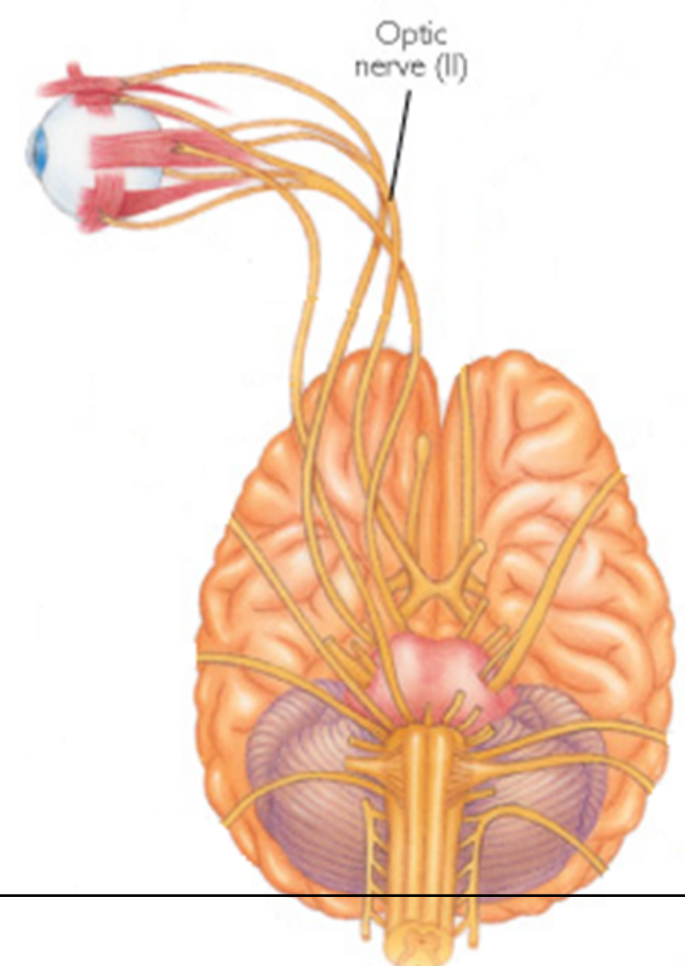
- ▶ SENSORY ONLY cranial nerve
- ▶ Smell sensation



- ▶ to test olfactory function, the patient should be asked to distinguish between smells such as coffee and cinnamon or other mild spices.
- ▶ Noxious stimulation (such as smelling ammonium salts) that irritate the nasal mucosa should be avoided.
- ▶ Test each nostril separately with familiar smells (e.g. coffee)

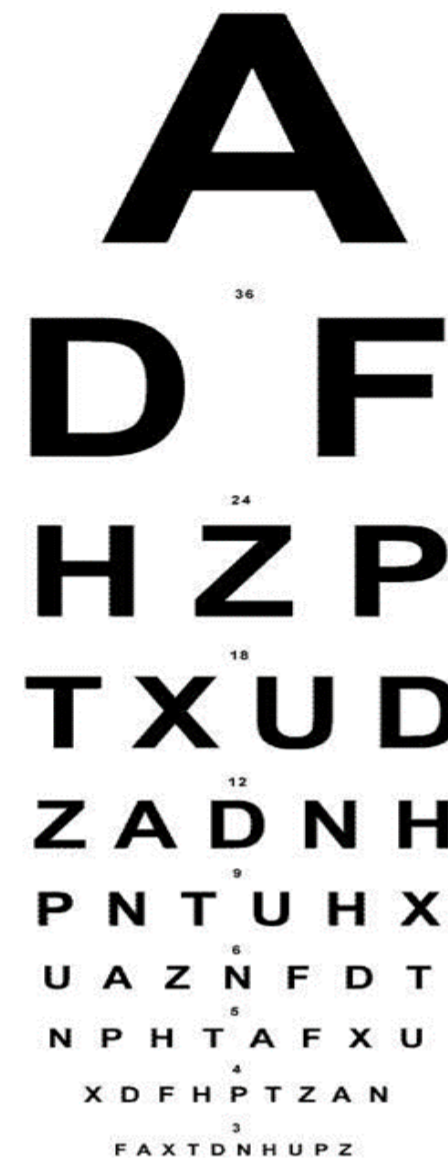
## CN2 – Optic nerve examination

- ▶ **SENSORY only** cranial nerve.
- ▶ Visual acuity
- ▶ Visual fields
- ▶ Reflexes:
  - ▶ Pupillary light reflex
  - ▶ Accommodation reflex
- ▶ Colour vision
- ▶ Fundoscopy



Visual Acuity- Snellen's chart at 6 metres. (bring them closer if they cannot read top letter)

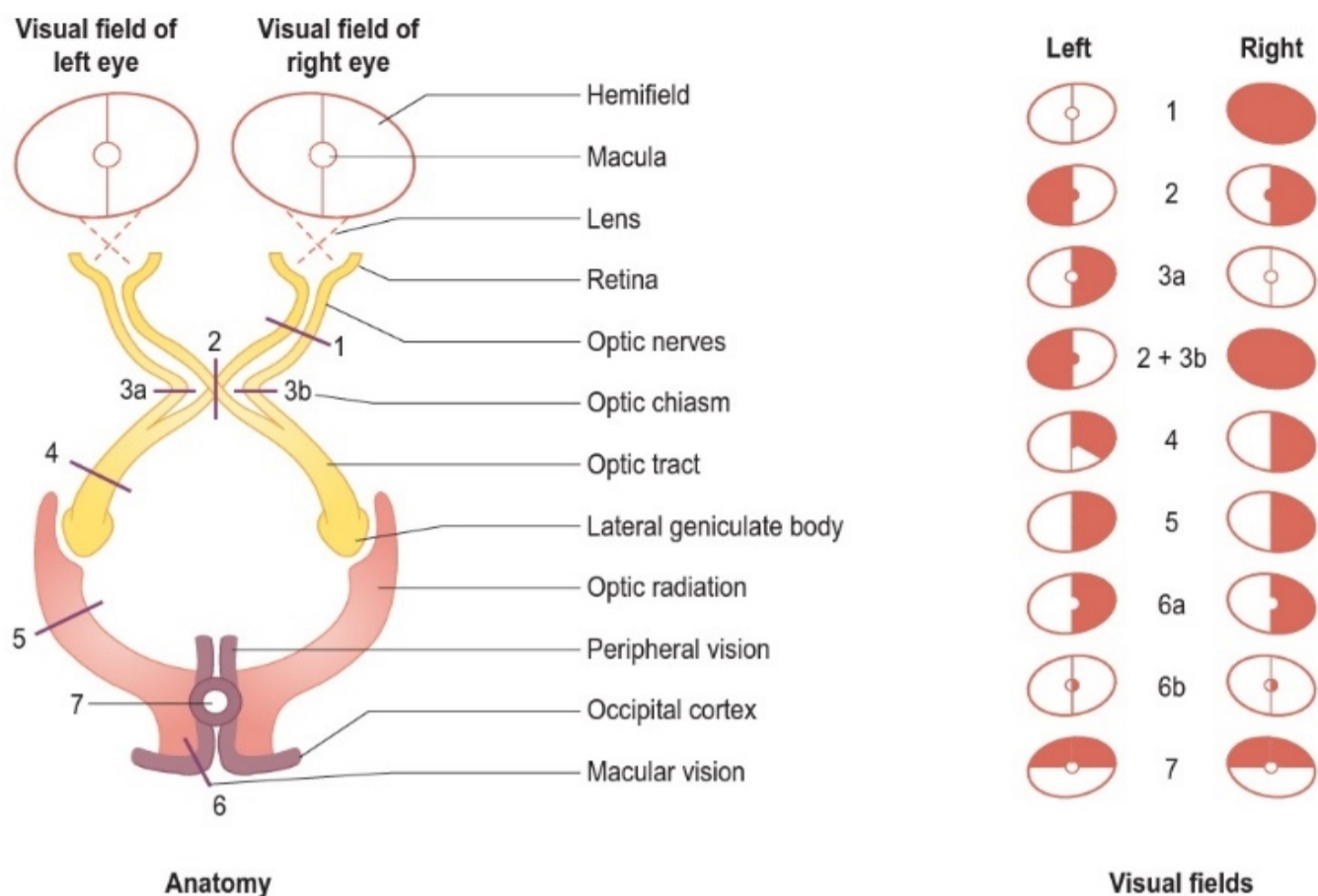
- ▶ One eye tested at a time
- ▶ With normal correction establish the smallest line patient can read
- ▶ If acuity too poor for Snellen chart, try:
  - Finger counting at 20cm
  - Hand movement
  - Perception of light



Visual fields:

- ▶ Ask patient to look at your eye
- ▶ Test one eye at a time
- ▶ Cover your eye that is opposite the patient's covered eye
- ▶ Ask patient to report finger movements on both sides, move inwards until they are able to see them
- ▶ Compare with your own visual field





**Figure 14.1** A diagram of the sensory visual pathways. Sites of lesions and the visual field defects they produce are shown.

- 1: Optic nerve lesion.
- 2: Optic chiasm lesion (bitemporal hemianopia).
- 3a or 3b: Unilateral nasal hemianopia (rare).
- 3a plus 3b: Binasal hemianopia (very rare).
- 4: Optic tract lesion (incongruous homonymous hemianopia).
- 5: Visual radiation (homonymous quadrantanopia or hemianopia).
- 6a: Occipital cortex lesion sparing the occipital pole (homonymous hemianopia with macular sparing).
- 6b: Occipital pole lesion (homonymous paracentral hemiscotoma).
- 7: A bilateral occipital cortex lesion (homonymous altitudinal hemianopia).

## Ocular reflexes

### Pupillary light reflex

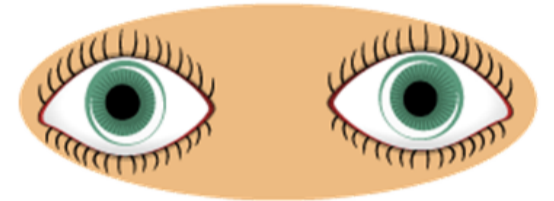
- ▶ Ask patient to fixate on a distant point
- ▶ Shine light into one eye
- ▶ Look for constriction of that pupil (direct reflex) and the other pupil (consensual reflex)



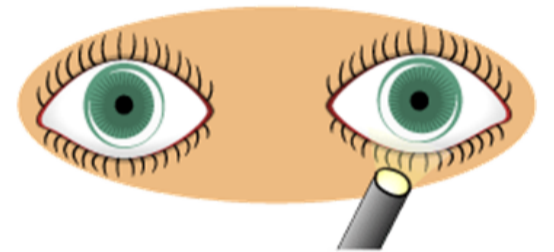
## Swinging light test

- ▶ Swing light between the eyes
- ▶ If optic nerve intact, both stay constricted
- ▶ If optic nerve damaged, pupils appear to dilate when light shone directly into it
- ▶ Relative afferent pupillary defect

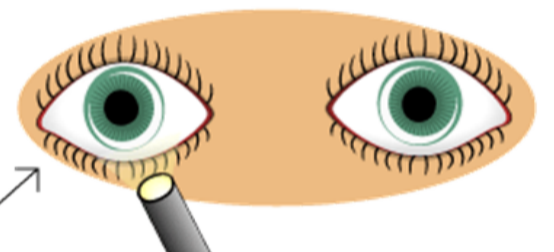
**No Light**



**Normal Response to Light**



**Positive RAPD of Right Eye**



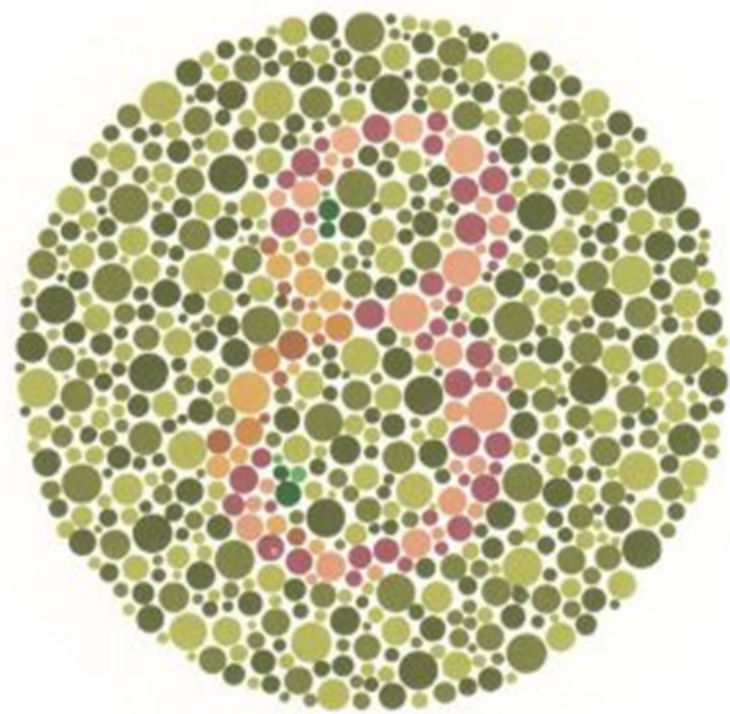
## Accommodation reflex

- ▶ Ask patient to fixate on distant object
- ▶ Present an object around 6 inches from their face and ask them to focus on it
- ▶ Look for pupil constriction



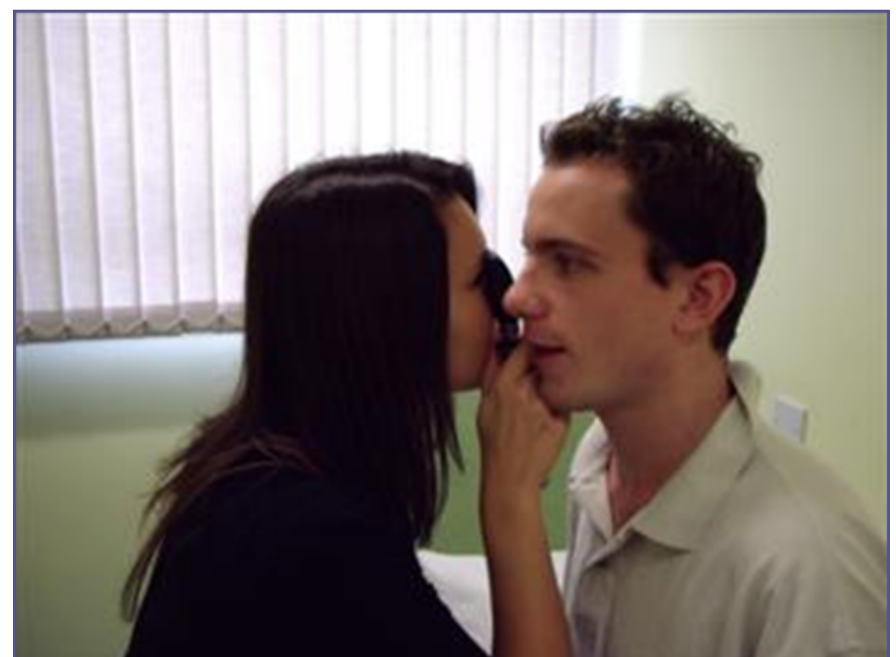
## Colour vision

- ▶ Ishihara plates – ask patient to read out the numbers
- ▶ Not always available (available as an iPhone app!)



## Fundoscopy

- ▶ This involves looking into the back of the patient's eye with an ophthalmoscope to visualise the retina and optic disc.



CN3 (OCULOMOTOR)  
CN4 (TROCHLEAR)  
CN6 (ABDUCENS)

- ▶ **MOTOR ONLY** cranial nerves.
- ▶ Eye movements:
  - ▶ CN3 – Superior rectus, Inferior rectus, Medial Oblique, Inferior oblique
  - ▶ CN4 – Superior Oblique
  - ▶ CN6 – Lateral Rectus

LR6 SO4

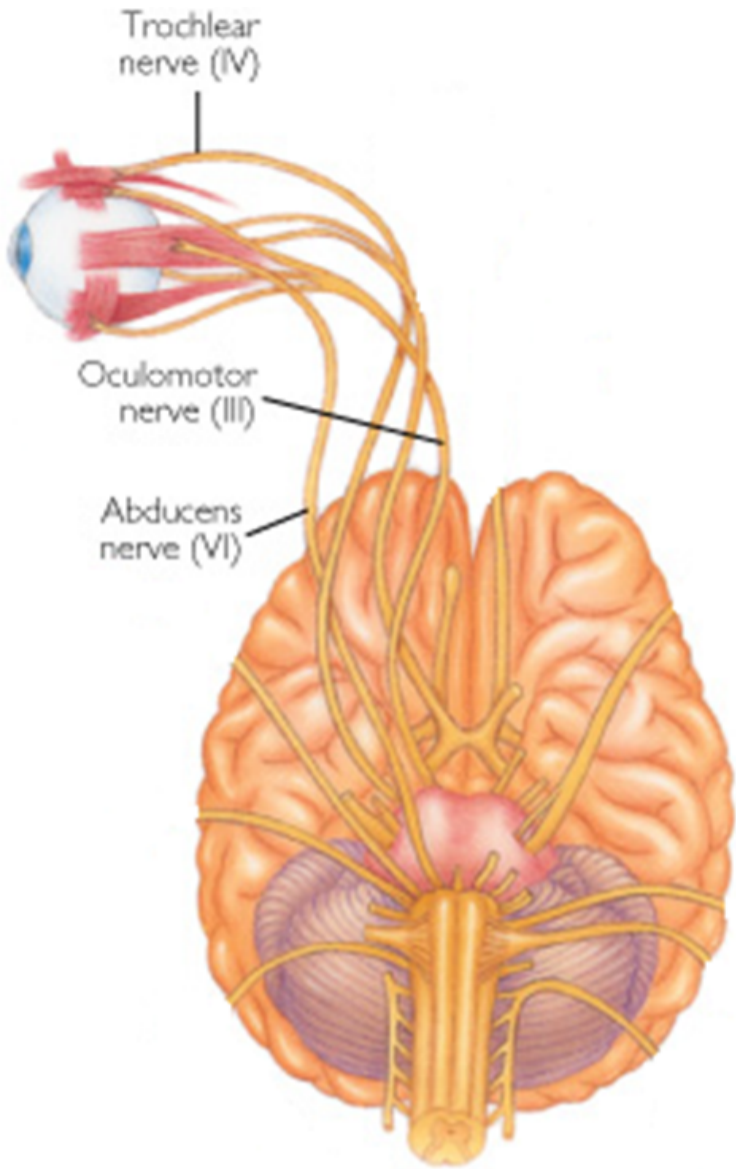


Table 14.1 Actions of the different external ocular muscles

Muscle actions	Primary	Secondary
Medial rectus	Adduction	–
Lateral rectus	Abduction	–
Superior rectus	Elevation (maximal in abduction)	Adduction, intorsion (maximal in adduction)
Inferior rectus	Depression (maximal in abduction)	Adduction, extorsion (maximal in adduction)
Superior oblique	Depression (maximal in adduction)	Abduction, intorsion (maximal in abduction)
Inferior oblique	Elevation (maximal in adduction)	Abduction, extorsion (maximal in abduction)

On inspection:

- ▶ Eye moves towards the muscles that still work

Third nerve palsy:

- ▶ Down and outward deviation
- ▶ = Tramps Pupil

Fourth nerve palsy:

- ▶ Subtle – Head tilted away from lesion

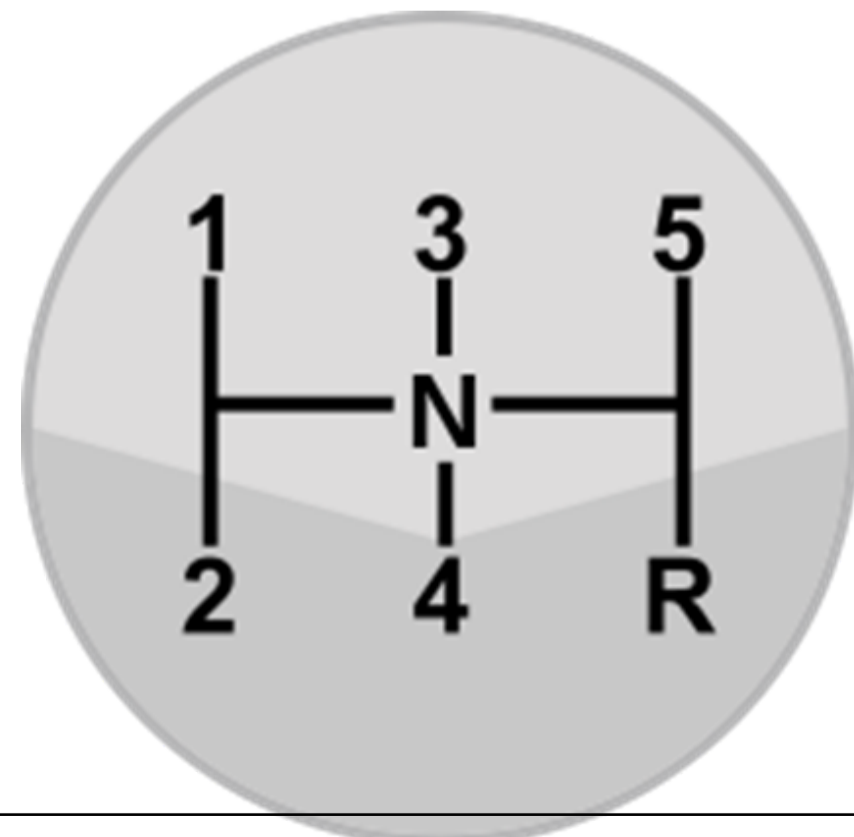
Sixth nerve palsy:

- ▶ Inward deviation
- ▶ Inability to look out



## Ocular movements

- ▶ Ask patient to keep their head still and follow your finger with their eyes
- ▶ Ask patient to report any double vision in neutral position or during test
- ▶ Move your finger slowly through a large double letter **HH**
- ▶ Observe for full eye movements



# CN5 – Trigeminal nerve

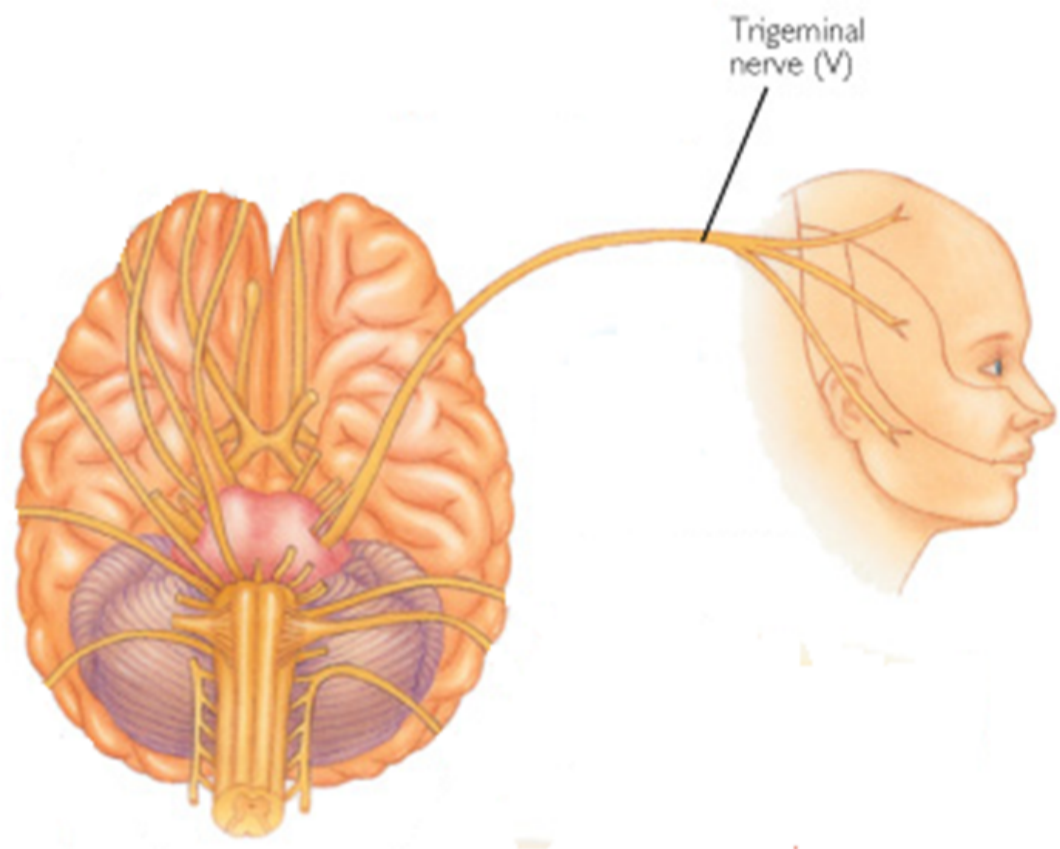
- ▶ SENSORY & MOTOR (mixed) cranial nerve

Sensory – 3 divisions:

- ▶ Ophthalmic
- ▶ Maxillary
- ▶ Mandibular

Motor:

- ▶ Muscles of mastication:
- ▶ Jaw jerk reflex



## Sensory testing

- ▶ Test light touch sensation in each of the areas shown
- ▶ Demonstrate on sternum for reference.
- ▶ Ask patient to close their eyes and report when they feel it and if it feels normal
- ▶ Corneal reflex – touch cornea lightly with cotton wool and look for blink in both eyes



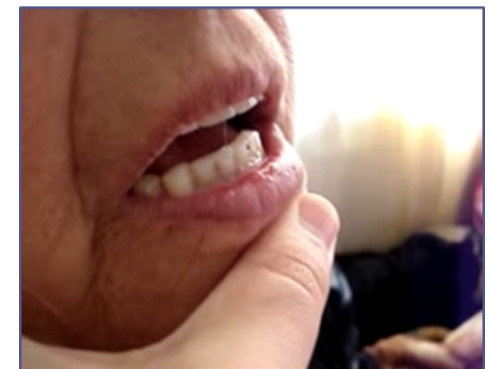
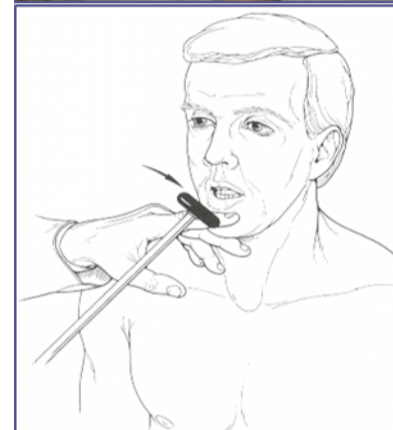
### Motor testing

- ▶ Muscles of mastication:
- ▶ Inspect for wasting
- ▶ Palpate on jaw clenching
- ▶ Resisted mouth opening



### Jaw jerk reflex

- ▶ Mouth slightly open, jaw relaxed
- ▶ Place finger on chin and tap with tendon hammer
- ▶ Normally absent or small
- ▶ Brisk in UMN lesions



## CN7 – Facial nerve

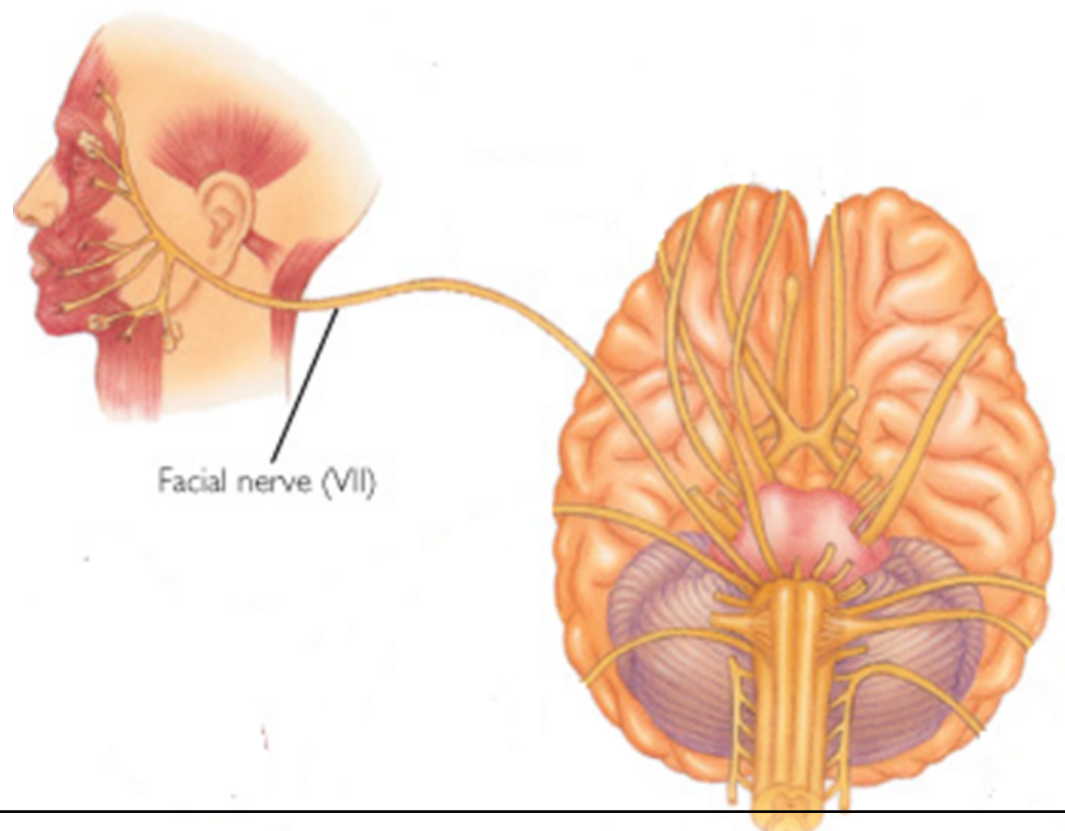
- ▶ SENSORY & MOTOR cranial nerve.

### Sensory

- ▶ Taste sensation to anterior 2/3 of tongue

### Motor

- ▶ Muscles of facial expression



Sensory:

Not routinely tested

Motor

- ▶ Muscles of facial expression – ask patient to:
  - ▶ Raise eyebrows
  - ▶ Close their eyes and don't let you open them
  - ▶ Smile
  - ▶ Puff out their cheeks



## CN8 – Vestibulocochlear nerve

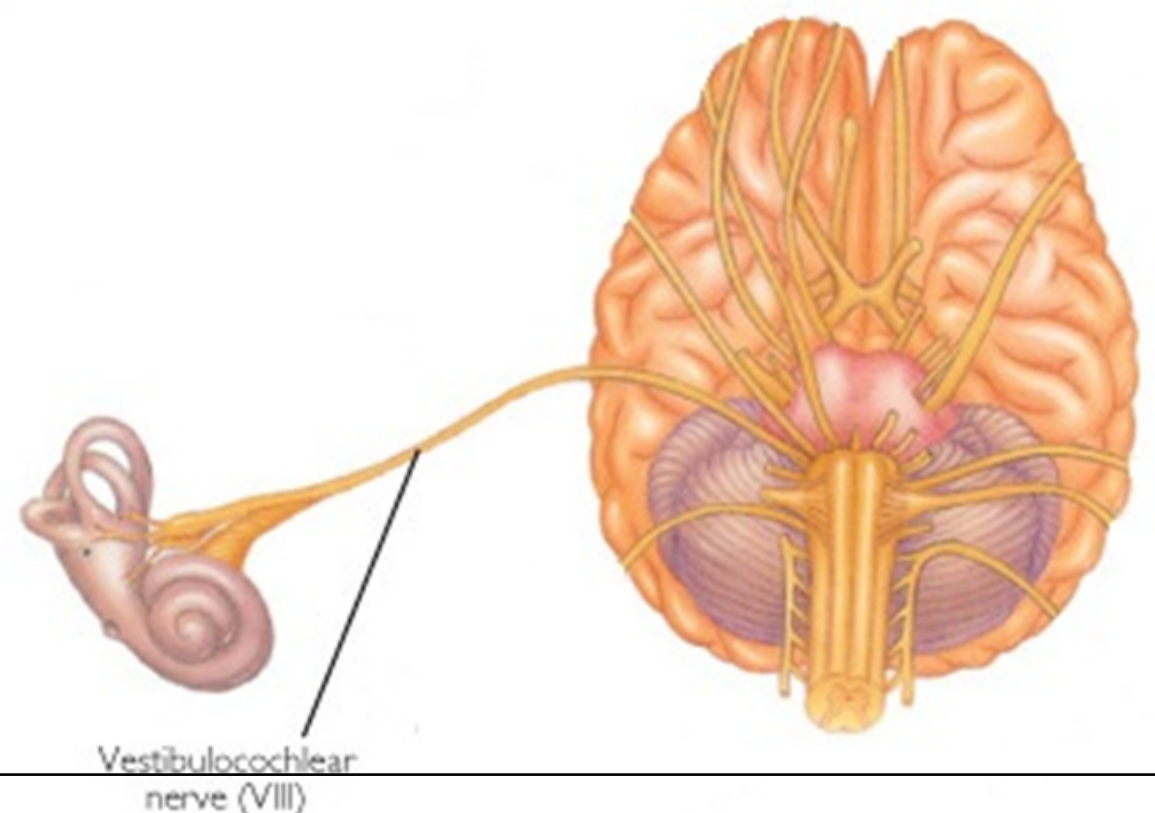
**SENSORY only** cranial nerve.

- ▶ Carries hearing and balance input from ear

Crudely test hearing

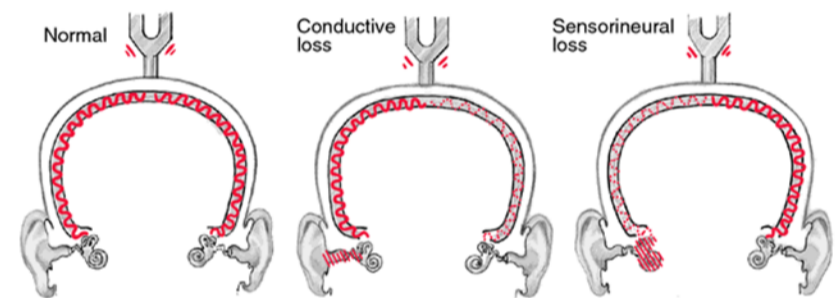
- ▶ Whisper a number into each ear whilst making a distracting sound in the other ear
- ▶ Ask patient to repeat the number

*If concerned, perform Weber's and Rinne's tests*



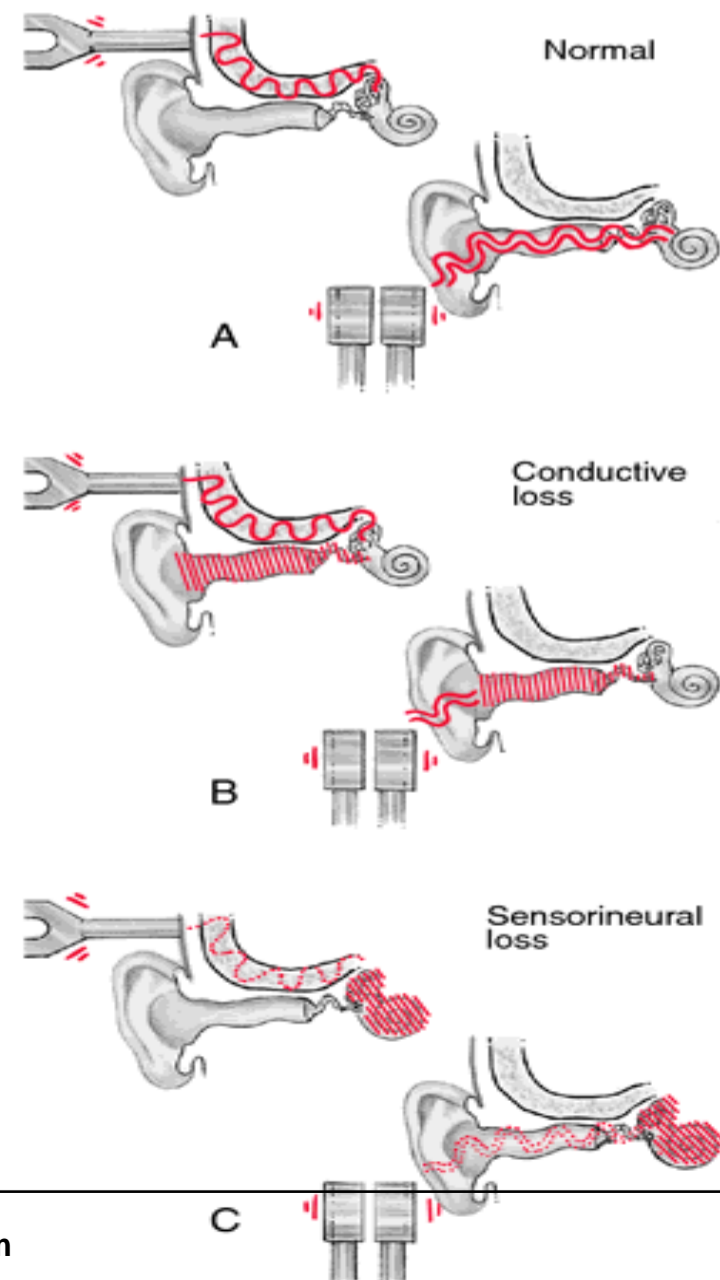
### Weber's test:

- Tuning fork in centre of forehead – in which ear does it sound louder?
- Normally equal in both ears.
- Conductive hearing loss:
  - Lateralises to affected side
- Sensorineural hearing loss:
  - Lateralises to non-affected side



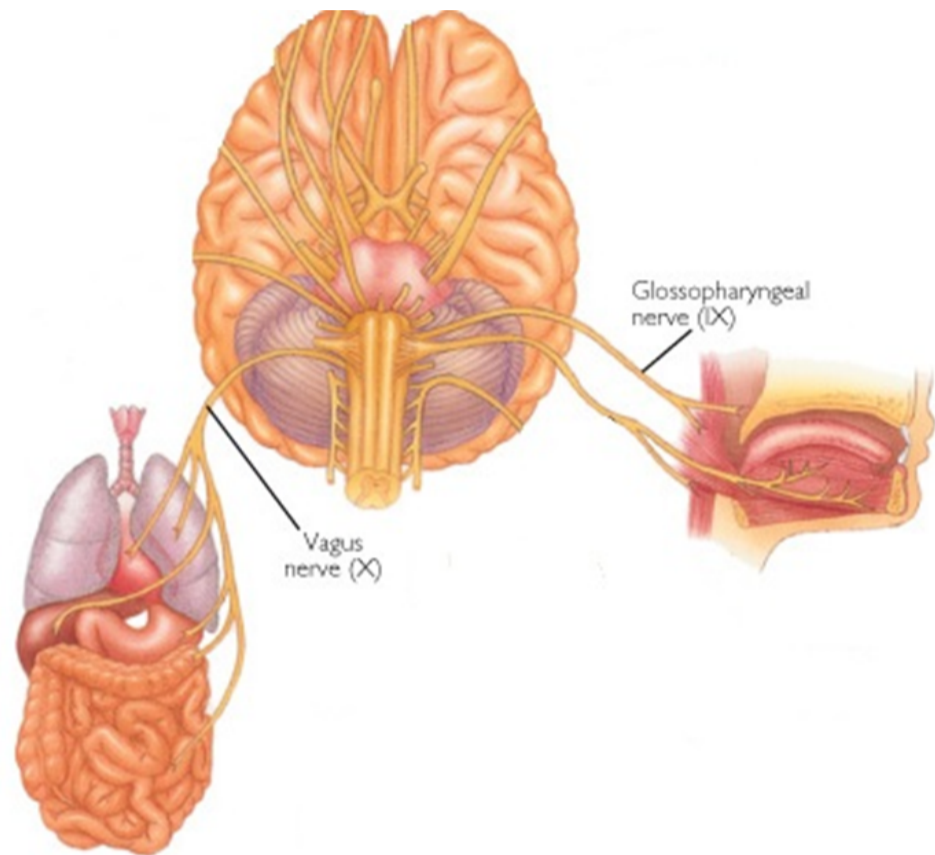
### Rinne's test

- Tuning fork on Mastoid
- When sound stops move next to ear
- Ask if can now hear it?
  - Yes = Normal
  - or Equally affected = Sensorineural Deafness
  - No = Conductive deficit



## CN9 & 10 – GLOSSOPHARYNGEAL & VAGUS NERVE

- ▶ **SENSORY & MOTOR**
- ▶ CN9 Sensory
  - ▶ Nasopharynx
  - ▶ Posterior 1/3 Tongue
  - ▶ Middle + Inner Ear
- ▶ CN10 Sensory
  - ▶ Pharynx + Larynx
- ▶ CN10 Motor
  - ▶ Pharynx + Larynx
  - ▶ Palate



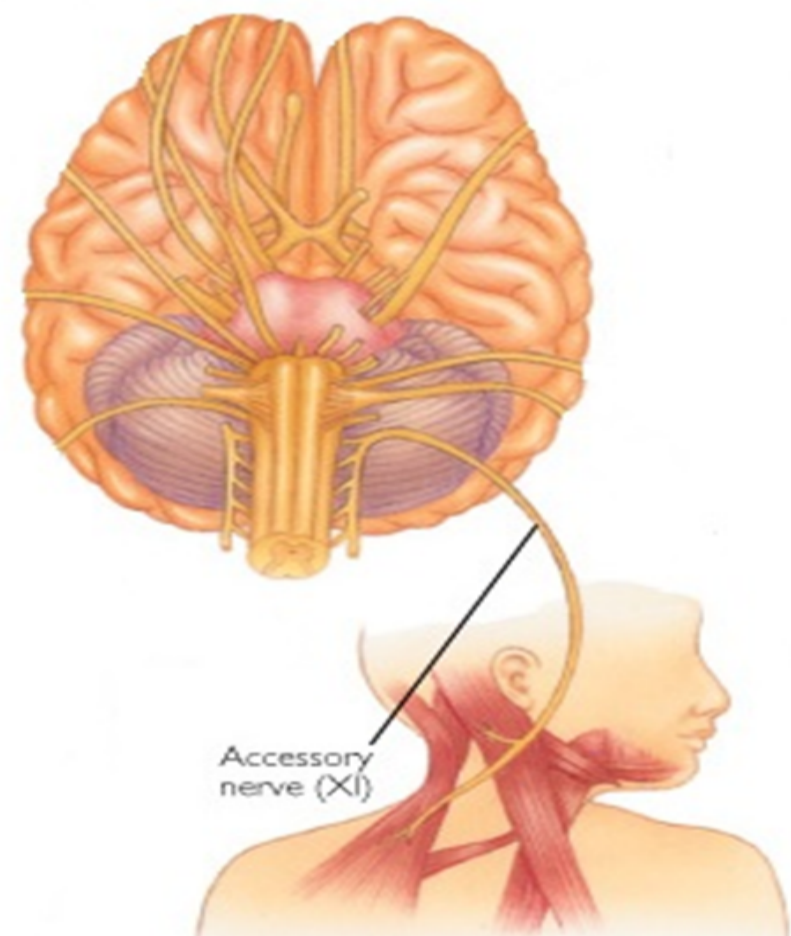
- ▶ Observe for any dysphonia
- ▶ Ask patient to open mouth wide and say "aah"
- ▶ Observe for any deviation of the uvula
- ▶ Deviation would be AWAY from the side of the lesion
- ▶ Gag reflex Not routinely done





## CN11 – Spinal accessory nerve

- ▶ **MOTOR only** cranial nerve
- ▶ Trapezius muscle
- ▶ Sternocleidomastoid muscle



### Trapezius muscle

- ▶ Ask patient to shrug their shoulders against resistance



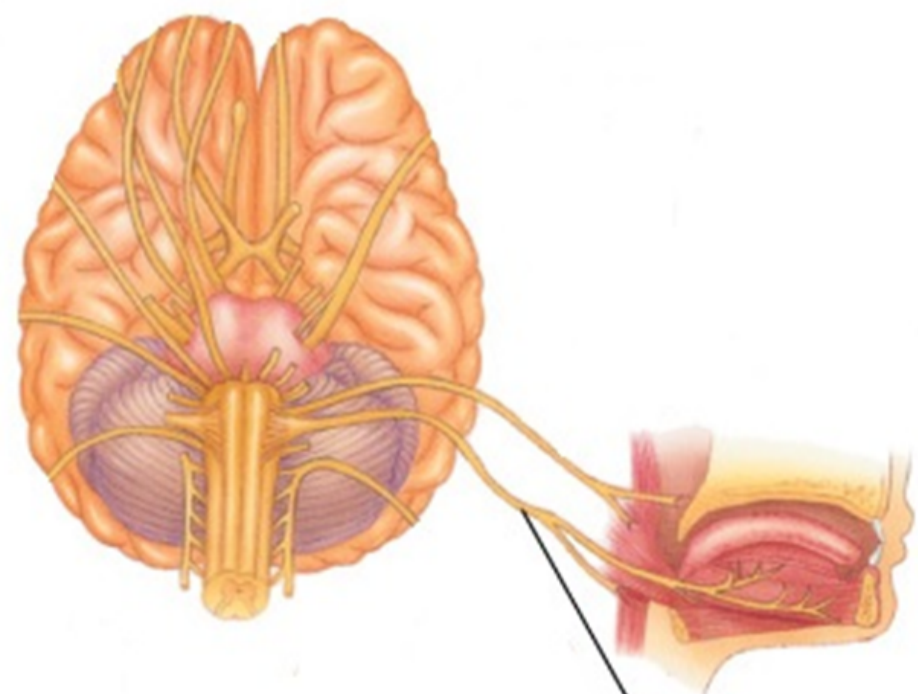
### Sternocleidomastoid muscle

- ▶ Ask patient to turn their head to each side against resistance



## CN 12 – Hypoglossal Nerve

- ▶ **MOTOR only**
- ▶ Muscles of the tongue



- ▶ Muscles of the tongue : Observe for fasciculations
- ▶ Ask patient to stick out their tongue
- ▶ Observe for deviation
- ▶ Deviation would be TOWARDS the side of the lesion
- ▶ Check power of muscles by asking patient to push their tongue into the side of their cheek and pressing on it from the outside





- ▶ Videos uploaded after sorting permission from “**The University of Utah**” neurology center.

[www.FirstRanker.com](http://www.FirstRanker.com)