EXAMINATION OF THE CRANIAL NERVES

I Olfactory:

Ask if the patient has noticed any abnormality of their sense of smell or taste. If they have, test each nostril in turn by asking the patient to sniff from a bottle containing something which smells (eucalyptus, benzoin etc). Do not expect them to be able to name the smell. Do not use ammonia.

❖ ***Fast exam*** *-omit*

II Optic

Visual acuity: test each eye separately – Snellen's charts or informally using any available text. (Do this before fundoscopy – the patient may be dazzled)

Test environment

- Check whether the patient has glasses.
- Explain the test procedure.

Test procedure

1. Use handheld text or 6 meter wall chart.
2. Ask patient to cover one eye (not close it) and read letters line by line from the top. Note the last line read with one or no errors.

Test interpretation

- This is essentially a test of macular vision.
- The numbers of the lines indicate the distance that a normally-sighted person would be able to see it. Visual acuity is expressed as the distance the letters are read/the distance at which they should be read. The numbers under each line of the chart indicates the distance at which they should be read. 6/12 means that at 6m the patient can just read the line that should just be visible at 12m.
- Normal acuity is 6/6 or < 6/6. Less than that indicates visual impairment.
- More severe visual impairment is expressed as
  'counts fingers'
  'perceives movement'
  'perceives light'

❖ ***Fast exam*** *-omit*

Visual fields (peripheral):

Test environment

- Check the patient can see out of both eyes.

Test procedure

Test the eyes separately asking the patient to cover each eye in turn. There are two equally acceptable methods. Both require careful explanation of what the patients is expected to do:

By confrontation – the standard method.

1. Get your head at the patient's eye-level
2. Cover your own eye opposite to the patient's covered eye.
3. Ask the patient to fix their gaze between your eyes.
4. Ask them to say 'yes' when the pin-head seen out of the corner of their eyes become red.
5. Holding a 'neurological' pin with a red head midway between your heads slowly bring it in from your extreme upper and lower nasal and temporal fields.
6. Check when *you* can just see the pin-head turn red.
7. Check when *they* say they can see the pin-head turn red.
8. This allows you to map their visual fields for colour onto yours an detect any abnormality.

(NB Make sure they can actually fix on the pin-head – don't hold it too close!)

By wiggling (the quick method)

1. Keep both your eyes open (the patient covers one eye).
2. Ask the patient to fix their gaze between your eyes.
3. Ask them to say 'yes' when they can just see your fingers wiggling out of the corner of their eyes.

4. Wiggle your fingers behind the patient's head and bring them slowly round into their extreme upper and lower nasal and temporal fields until they perceive movement. Do the same for each quadrant of each eye.

❖ ***Fast exam - Screening.***

1. Both you and patient's eyes open.
2. Wiggle your fingers in patient's upper temporal fields.
3. Ask whether they see wiggling in their right, left or both eyes.
4. Only test nasal fields if a defect appears.

(This will also test *sensory inattention.* The patient has no field loss but always indicates movement on one side when both fingers are wiggled. This indicates a parietal lobe disorder.)

Test interpretation

- The majority of field defects are quite gross. The patient will not see anything until the object crosses into the normal field almost directly in front of the eye.
- There are three major defects:

1. Homonymous hemianopia – the patient is unable to see objects in either the right or the left visual fields. The lesion is in the opposite optic tract or optic radiation
2. Bitemporal hemianopia – the patient is unable to see objects in either temporal field. The lesion is in the opposite optic nerve.
3. Scotomas – the patient has a roughly circular area of blindness in either visual field. The lesion is in the same retina. If this is suspected the examination methods above need to be modified as follows:

Visual fields (Central):

1. Get your head at the patient's eye-level
2. Cover your own eye opposite to the patient's covered eye.
3. Ask the patient to fix their gaze between your eyes.
4. Tell them you will move the pinhead or other object across their field of vision. Ask them to say 'yes' if the pin-head disappears.
5. Holding a 'neurological' pin midway between your heads slowly bring it across their field of vision.
6. If you are using a red pin it is helpful to ask if the colour changes to something less bright.

(NB Make sure they can actually fix on the pin-head – don't hold it too close!)

Fundi

Test environment

- Check whether the patient has glasses. They should remove them and note whether the lenses are convex (+ve) or concave (-ve). You will need to make allowances for this when you set up the opthalmoscope.
- Darken the room and allow the patient's eyes to accommodate. If they are still constricted you may need to use tropicamide 0.5 % eye drops to dilate the pupil (This will not precipitate glaucoma). *NB do not dilate the pupils if the patient has recently had a head injury or their consciousness is impaired. Warn them not to drive or operate machinery for 2 hours after the test.*
- Explain the test procedure.

A. Test procedure

1. Darken the room if possible.
2. Sit or stand at eye-level with the patient.
3. Adjust the opthalmoscope lens to between 0 and –4 if neither of you need glasses. If you do 'dial in ' the approximate power of your lenses. This need not be exact.
4. Remove your own glasses.
5. Put the opthalmoscope to your right eye to examine the patient's right eye and vice versa.
6. Start looking about 1m from the patient. You should see a bright pink reflection from the patients eye. This is the red reflex. It means that there is no opacity preventing light reaching the fundus.
7. Now get the patient to fix on a distant object and look for the optic disc. This is a pale pink object in the fundus and is seen about 15^{o} out from the sagittal plane as if you were aiming for the

back of the patient's other ear. The optic disc is seen as the place where all the vessels converge. If all you can see is a blur try turning the focussing wheel.
8. Follow the superior and inferior temporal and nasal arteries and veins out from the disc and examine the four quadrants of the fundus.
9. Find the macula. This is a featureless spot two disc widths from the optic disc on the temporal side.

Test interpretation

Be familiar with the most common fundal abnormalties.

II & III Oculomotor

Test environment

- Remove the patient's glasses.
- Make sure the ambient illumination is not too bright

Test procedure

- Explain the test procedure.

Pupils: look at the pupils - are they round and equal size?

- small – (old age, opiates, Horner's syndrome, pilocarpine, iritis)
- large – (young, alcohol, atropine and other mydriatics, third nerve palsy)

1. Ask the patient to look straight ahead.
2. Quickly swing a torch beam from the side to illuminate the retina.
3. Look for constriction of that pupil – this is the *direct* response
4. Repeat the action and look for constriction in the pupil of the opposite eye – this is the consensual response

Test interpretation

1. no response to light, response to accommodation = optic nerve defect
2. neither pupil responds to light in the blind eye, both respond to light in the normal eye = afferent defect.
3. pupil does not respond to light in either eye = efferent defect (third nerve defect) -

Accommodation reflex:

Test procedure

1. Ask the patient to look at an object in the distance and then at finger 20cm from their nose. Both pupils should constrict.

Test interpretation

Pupil reacts to accommodation but not to light = Argyll Robertson pupil Holmes-Adie pupil, midbrain lesion, ocular blindness

III Oculomotor, IV Trochlear, VI Abducens

Eye movements:

Test procedure

1. Ask the patient to follow your finger or a point object with their eyes and tell you if they see double. If necessary hold their head steady by holding onto their chin gently.
2. Move the object across the plane of vision and then up and down near when they are looking to one side. The shape of your movements is the letter 'H'
3. Watch for non-parallelism of their visual axes.
4. Watch for nysagmus
5. Ask them again if they saw double at at any time.
6. Ask them to look upwards to test conjugate gaze

Test interpretation

Principles:

1. the eye that is not moving fully sees the peripheral image in diplopia
2. The diplopia gets worse as the affected eye moves in the direction of pull of the affected muscle
3. diplopia may be caused by a muscle or a nerve lesion

Paralytic squint:

- III palsy - ptosis, eye deviated down and out, large fixed pupil.
- IV palsy - diplopia when the affected eye looks down whilst looking slightly inward (towards the nose).
- VI palsy - cannot abduct eye, diplopia when looking to side of the lesion.
- if a patient sees double in all directions consider third nerve palsy, thyroid eye disease or myasthenia gravis

Concomitant non-paralytic squint (childhood squint):
Usually there is no double vision as one eye is ignored by the brain

Failure of upward gaze
Suggests frontal lobe lesions

Double or triple vision with one eye closed.
Monocular diplopia sometimes occurs with refractive errors. Multiple images suggests a non-organic lesion.

Nystagmus (really VIIIth nerve)
Test procedure:
Ask the patient to look at your finger at the extreme right, left, upward and downward directions of gaze.
Observe the:

- Direction of the nystagmus. This is the direction of the rapid phase.
- Type of nystagmus – vertical, horizontal rotatory or mxed.
- Whether the direction changes as the direction of gaze changes
- Whether it is sustained or not, particularly if asking the patient to fix their gaze on an object suppresses it

Interpretation
Distinguish *peripheral* nystagmus associated with diseases of the ear and the 8th nerve from that caused by disease of the vestibular nerve connections *centrally* within the brainstem.
Principles:

1. Central nystagmus is not associated with vertigo.
2. Central nystagmus may be associated with 'neighbourhood' signs. These are:
    - Bilateral limb weakness
    - Bilateral facial weakness
    - Bilateral sensory changes
    - Diplopia
    - Homonymous hemianopia
    - Cortical blindness
    - Dysarthria
    - Dyspahgia
3. Peripheral nystagmus is usually suppressed by visual fixation on an object, often has mixed horizontal and rotatory components and fatigues with time. Central nystagmus is never suppressed by fixation and is sustained.
4. Peripheral nystagmus is never multidirectional, the rapid phase is always to the same side. This is away from the side of the lesion.
5. Peripheral nystagmus can be provoked by rapid head movements that stimulate the semi-circular canals.
6. Peripheral nystagmus may be associated with deafness ond/or tinnitus. Central nystagmus is not.

These rules are given in the table below. The most reliable tests are given first:

Nystagmus	Peripheral	Central
Suppressed by fixation	***YES***	no
Associated with vertigo	***YES***	no
Associated with tinnitus and/or deafness	***YES***	no
Associated with bilateral weakness/sensory loss hemianopia/dysarthria/dysphagia/diplopia	no	***YES***
Multidirectional	no	***YES***
Provoked by rapid head movements	***YES***	no
Pure horizontal, vertical or rotatory	no	***YES***

NB a few beats of nystagmus on extreme lateral gaze are normal.

V Trigeminal

Sensory:

Test environment

- Explain the procedure for sensory testing.

Test procedure

Touch each of the 3 divisions with cotton wool testing each side alternately. (see diagram)
Corneal reflex - touch the *edge* of the cornea, not the conjunctiva. This reflex is not usually tested in the conscious patient.

Interpretation

The cotton wool should be felt all over the face. Both eyes should blink when the cornea is touched. Failure indicates damage to the afferent (Vth nerve) or efferent (VIIth nerve) pathway.

❖ ***Fast exam -.****Omit unless the patient complains of sensory loss*

Motor:

- ask the patient to open mouth against resistance. Mouth should open in the midline**.**
- Ask the patient to clench their teeth. Feel for contraction of the masseter and temporalis muscles.

Interpretation

If the jaw protrudes to one side on opening this indicates weakness of the pteyrgoids on the same side. (see figure)
(Watch out for bilateral weakness in myopathies.)

VII Facial

Ask patient to raise eyebrows, puff out cheeks, close eyes tightly, whistle and show teeth or (not all at once!)

❖ ***Fast exam – show teeth only***

Interpretation

- In supranuclear lesions movements of the upper part of the face are spared. The patient can still raise their eyebrows but mouth asymmetry will be obvious when they show their teeth. (see figure).
- In infranuclear lesions the whole side of the face is affected and there may be muscle atrophy.
- It should be impossible to open the patient's eyes if facial nerve function is intact.
- Sounds may seem louder on the affected side because of paralysis of the stapedius muscle.

Taste anterior 2/3 of tongue: not usually tested and is not affected in supranuclear lesions.

VIII Auditory

Vestibular branch - check for nystagmus (see under III Oculomotor, IV Trochlear, VI Abducens)

Test environment

- Explain the test procedure.
- Ensure a reasonably quiet environment

Test procedure:

- Acoustic branch - check their hearing from the external auditory meatus, either by whispering or by rubbing fingers lightly together.

Interpretation:
If you suspect reduced hearing acuity decide if the problem is one of sound conduction through the ear (conductive deafness) or conversion of sound into nerve impulses (sensori-neural deafness).

Rinne's Test:
Test procedure:
Place vibrating tuning fork on the mastoid and ask the patient to say when it has stopped. When the patient says the sound has stopped, hold the fork at the meatus, rotating it slightly.
Interpretation:
If the sound is still heard air conduction > bone conduction - this is found in sensori-neural deafness. If not heard bone conduction > air conduction – the finding in conductive deafness.
- ❖ Quicker method – just ask patient which position is loudest.

Weber's Test:
Test procedure:
Hold vibrating tuning fork in the middle of the patient's forehead. Ask in which ear the sound is loudest.
Interpretation:
- It should be heard equally loudly in both ears.
- if sound located more on one side then conductive deafness exists on that side or the opposing ear has sensorineural deafness.
- ❖ ***Fast exam - Screening.*** Rub finger and thumb together 1 inch away from the ear. Only proceed to other tests if the patient cannot hear it.

IX Glossopharyngeal
Test procedure:
The gag reflex:
Stroke the back of the pharynx with a cotton-wool swab.
Test taste on the posterior 1/3 of the tongue (rarely done!)
Interpretation:
The patient should gag when the pharynx is stroked. Gag reflex tests IX (sensory) and X (motor).

X Vagus
Test procedure:
1. Ask patient to say 'Ahh' and look for symmetry of movement of the pillars of the fauces as they rise and whether the uvula remains central.
2. Check if the patient can swallow normally?
3. Is there dysarthria or dysphonia?

Interpretation:
- The paralysed side of the palate fails to rise and the uvula swings to the other side.
- The patient may cough or choke when attempting to drink
- The patient cannot clearly say words that depend on effective palatal closure. Thus '"Try rubbing an egg in it!" becomes "Try rummin an enn in iht!"

XI Accessory
Test procedure:
Ask the patient to shrug shoulders and to put his chin on each shoulder in turn against resistance.

XII Hyoglossal
Test procedure:
Ask the patient to put out tongue
Interpretation
- If deviated then that is the weak side.
- Look for fasciculation or wasting with tongue in the mouth. These indicate an infranuclear lesion.