

The Neurological  
Examination  
Special Senses  
Assessing vision and hearing

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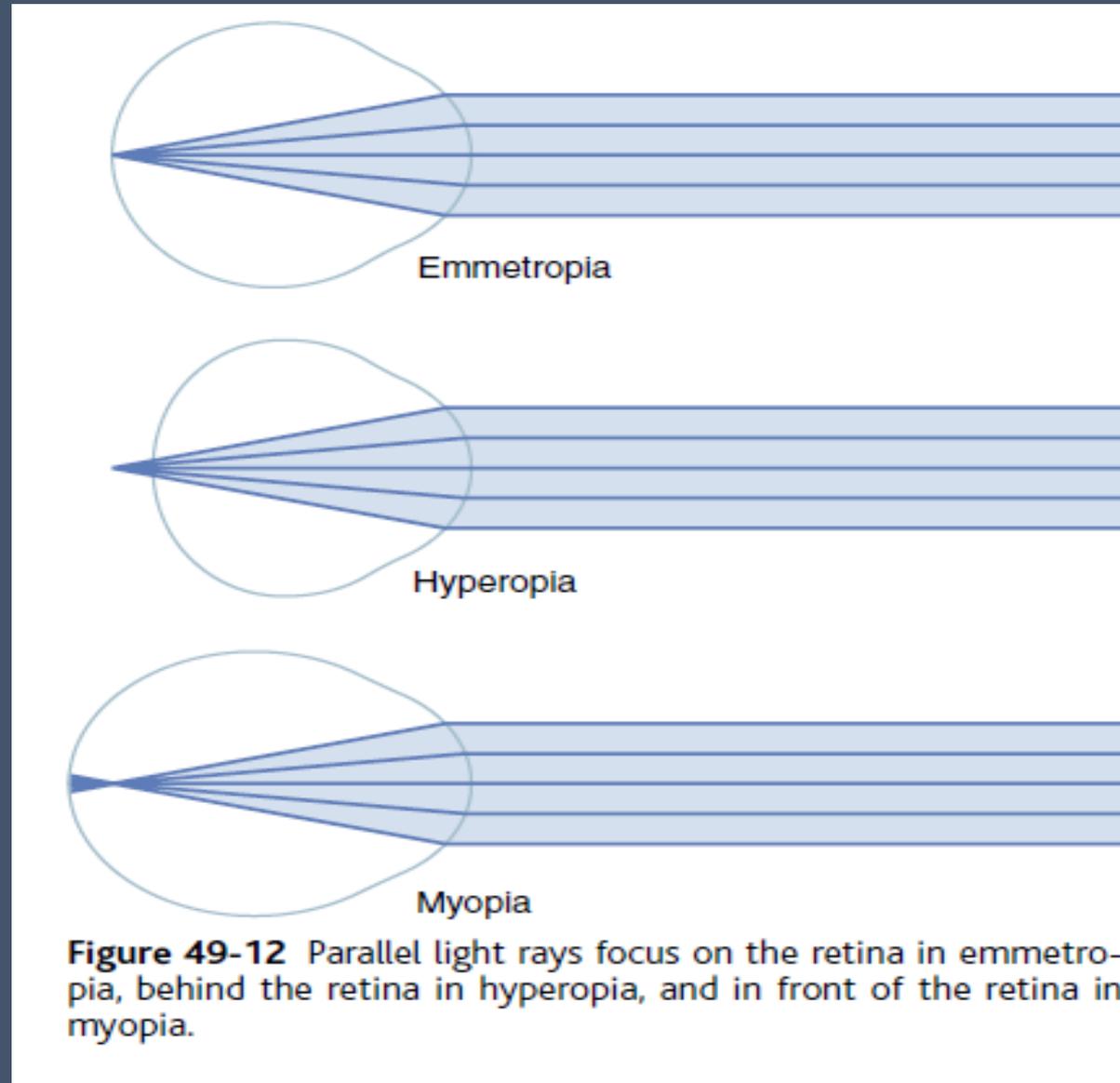
# Assessing vision

- Assess visual acuity
- Assess for color vision

# Errors of refraction

In hyperopia the eyeball is too short or the lens system is too weak.

In myopia the eyeball is too long an eyeball or the lens system is too active.



# Visual Acuity

- Visual acuity refers to the ability of the eye to appreciate two points 1.75 mm apart as two distinct points (indicates the sharpness or clarity of vision).
- Assessment of visual acuity is mandatory in all ophthalmic patients. Each eye must be tested separately. The most commonly used method of testing for distance vision is Snellen chart, which displays a random selection of letters at diminishing font size in successive lines.
- Each line is marked with a number (60,36,24,18,12,9 & 6). This represents the distance in meters at which a normally sighted person could read that line.

# Assessment of visual acuity (distance)

- Seat the patient 6 meters away from the chart
- Each eye needs to be tested separately
- Use an occluder to cover the eye that is not being tested
- Ask patient to read from the top letter
- Keep going until they can't read the line clearly or they make more than 2 mistakes in a line.
- The result is expressed as a ratio  $X / Y$ , where  $X$  is the testing distance and  $Y$  refers to the line containing the smallest letter that the patient identifies.

60

A

36

D F

24

H Z P

18

T X U D

12

Z A D N H

9

P N T U H X

6

U A Z N F D T

3

N P H T A F X U

4

X D F H P T Z A N

3

F A X T D N H U P Z

60

A

6/60

36

D F

6/36

24

H Z P

6/24

18

T X U D

6/18

12

Z A D N H

6/12

9

P N T U H X

6/9

6

U A Z N F D T

6/6

4

N P H T A F X U

6/5

3

X D F H P T Z A N

2

F A X T D N H U P Z

- You can have the patient read through a pinhole to see if this improves vision (if vision is improved with a pinhole, it suggests there is a refractive component to the patient's poor vision).
- If the patient cannot see the largest font letter, reduce the test distance to 3 meters, then to 1 meter if necessary.
- If they still cannot see the largest font letter, document instead whether they can count fingers, see hand movement or just perceive the difference between light and dark.



# Assessment of near vision

- The Jaeger eye chart (or Jaeger card) is used to test and document near visual acuity at a normal reading distance. It has print samples of different sizes (No. 1-No.11). Anyone with normal vision should be able to read the smallest print in good lighting, at a comfortable reading distance.
1. Ask the patient to hold the test card 37 cm away from the eyes.
  2. Test each eye alone.
  3. Ask the patient to go to the smallest block of text they feel can see without squinting, and read that passage aloud.
  4. Record the “J” value of the smallest block of text he can read

# Jaegar eye chart

No. 1.  
.37M

In the second century of the Christian era, the empire of Roman comprehended the fairest part of the earth, and the most civilized portion of mankind. The frontiers of that extensive monarchy were guarded by ancient renown and disciplined valor. The gentle but powerful influence of laws and manners had gradually cemented the union of the provinces. Their peaceful inhabitants enjoyed and abused the advantages of wealth.

No. 2.  
.50M

fourscore years, the public administration was conducted by the virtue and abilities of Nerva, Trajan, Hadrian, and the two Antonines. It is the design of this and of the two succeeding chapters, to describe the prosperous condition of their empire; and afterwards, from the death of Marcus Antoninus, to deduce the most important circumstances of its decline and fall; a revolution which will ever be remembered, and is still felt by

No. 3.  
.62M

the nations of the earth. The principal conquests of the Romans were achieved under the republic; and the emperors, for the most part, were satisfied with preserving those dominions which had been acquired by the policy of the senate, the active emulations of the consuls, and the martial enthusiasm of the people. The seven first centuries were filled with a rapid succession of triumphs; but it was

No. 4.  
.75M

reserved for Augustus to relinquish the ambitious design of subducing the whole earth, and to introduce a spirit of moderation into the public councils. Inclined to peace by his temper and situation, it was very easy for him to discover that Rome, in her present exalted situation, had much less to hope than to fear from the chance of arms; and that, in the prosecution of

No. 5.  
.75M

the undertaking became every day more difficult, the event more doubtful, and the possession more precarious, and less beneficial. The experience of Augustus added weight to these salutary reflections, and effectually convinced him that, by the prudent vigor of

No. 4.  
1.25M

his counsels, it would be easy to secure every concession on which the safety or the dignity of Rome might require from the most formidable barbarians. Instead of exposing his person or his legions to the arrows of the Parthians, he obtained, by and honor-

No. 7.  
1.50M

able treaty, the restitution of the standards and prisoners which had been taken in the defeat of Crassus. His generals, in the early part of his reign, attempted the reduction of Ethiopia and Arabia Felix. They marched near a thou-

No. 8.  
1.75M

sand miles to the south of the tropic; but the heat of the climate soon repelled the invaders, and protected the unwarlike natives of those sequestered regions

No. 9.  
2.00M

The northern countries of Europe scarcely deserved the expense and labor of conquest. The forests and morasses of Germany were

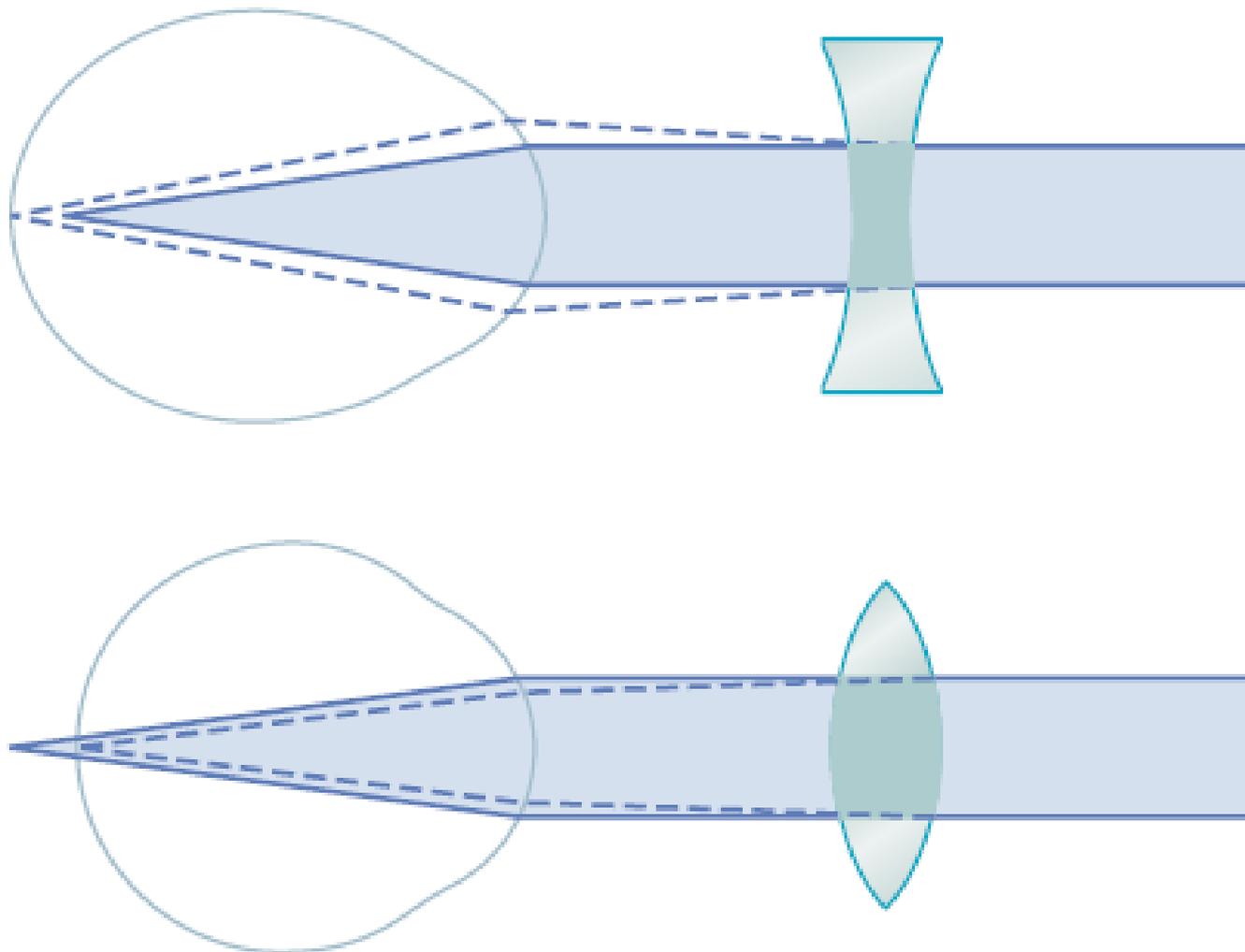
No. 10.  
2.25M

filled with a hardy race of barbarians who despised life when it was separated from freedom; and though, on the first

No. 11.  
2.50M

attack, they seemed to yield to the weight of the Roman power, they soon, by a signal

- <https://www.youtube.com/watch?v=9EQYxrQa0-8&list=PLwYICl63HBzkXbEb6dDJBb0mP8o--91ox&index=6>
- 0:25 – 2:10



**Figure 49-13** Correction of myopia with a concave lens, and correction of hyperopia with a convex lens.

The power of the lens needed to correct the visual acuity problem is determined by trial and error

# Color vision

- The retina contains two types of photoreceptors; the rods and cones.
- Cones are responsible for color vision.
- There are three types of cones, each containing a specific photopigment called an opsin that is most sensitive to particular wavelengths of light (blue, green and red).
- The brain combines input from all three types of cones to produce normal color vision.

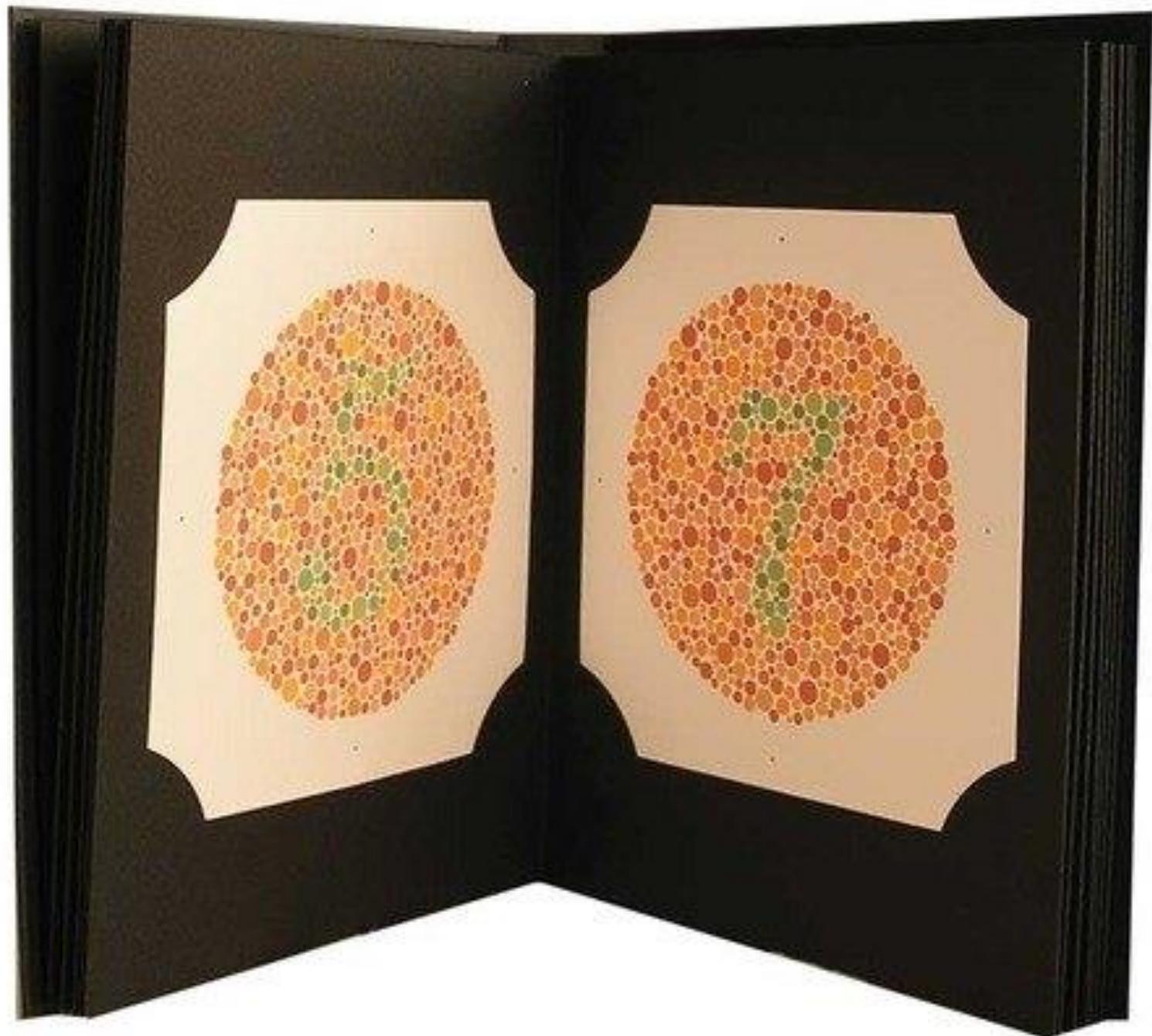
# Color Vision Deficiency

- Color vision deficiency (color blindness) represents a group of conditions that affect the perception of color.
- Usually, color deficiency is an inherited condition.
- Disease or injury that damages the optic nerve or retina can also cause loss of color recognition in such case the condition might affect one eye only.

- Red-green color vision defects are the most common form of color vision deficiency. Affected individuals have trouble distinguishing between some shades of red, yellow, and green. It is an X-linked genetic disorder.
- Blue color vision defects, which are rarer, cause problems with differentiating shades of blue and green. Defect in Chromosome 7

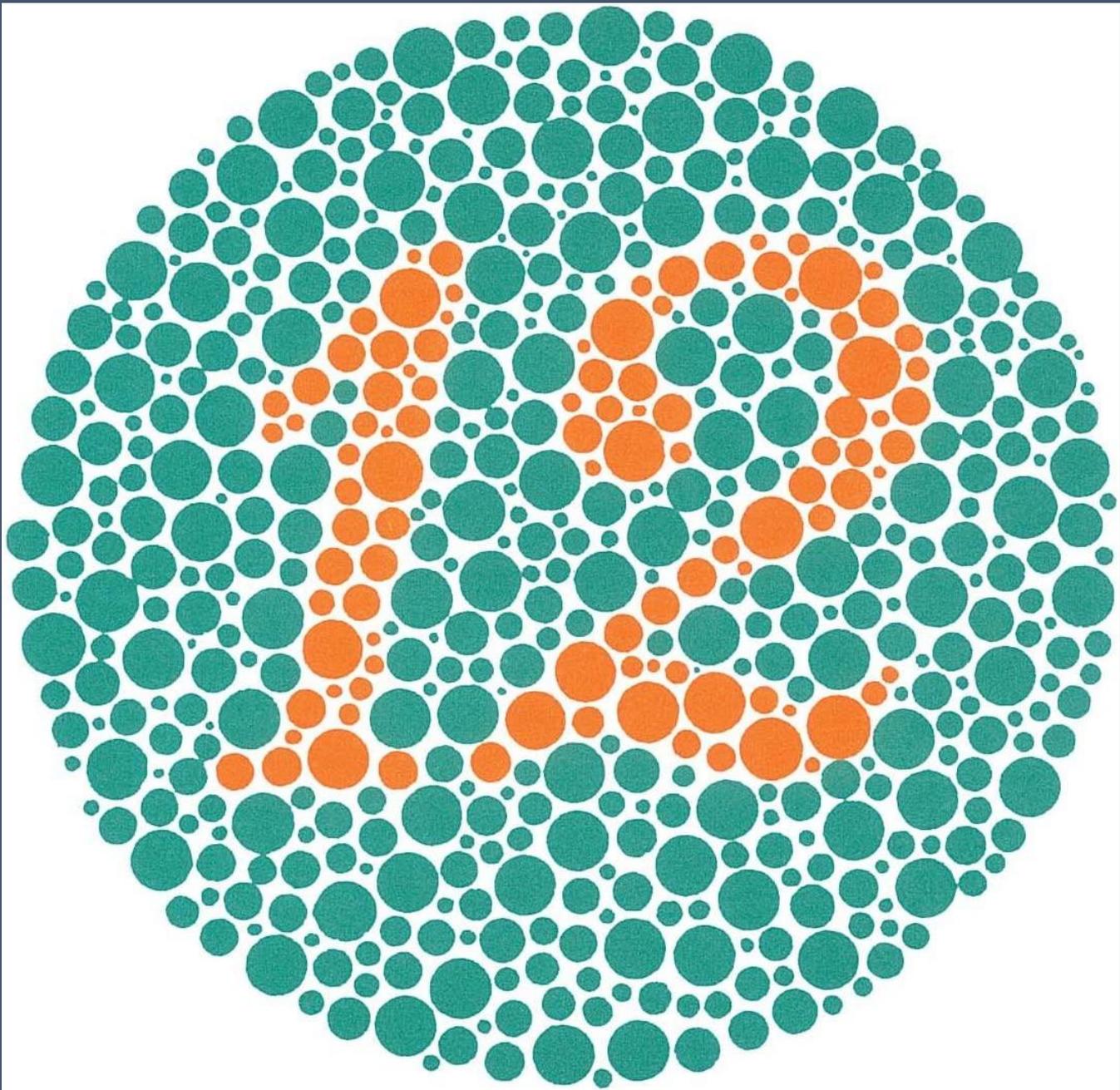
# Assessment of color vision

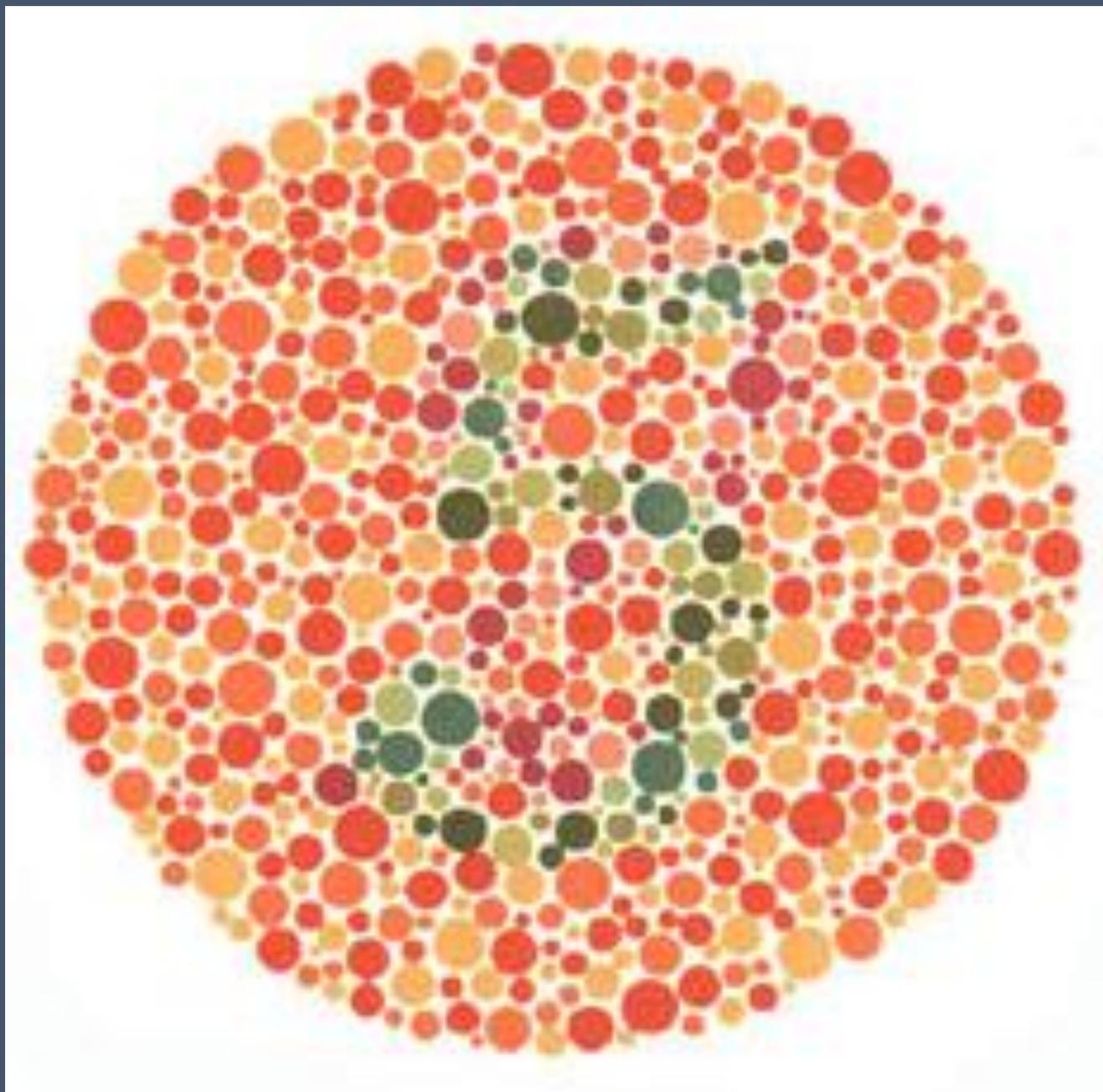
- The patient is shown a series of specially designed pictures composed of colored dots, called pseudoisochromatic plates. Most commonly used is Ishihara plates.
- Ishihara plates, each of which contains a coloured circle of dots. Within the pattern of each circle are dots which form a number that is clearly visible to those with normal colour vision and difficult or impossible to see for those with colour vision defect.

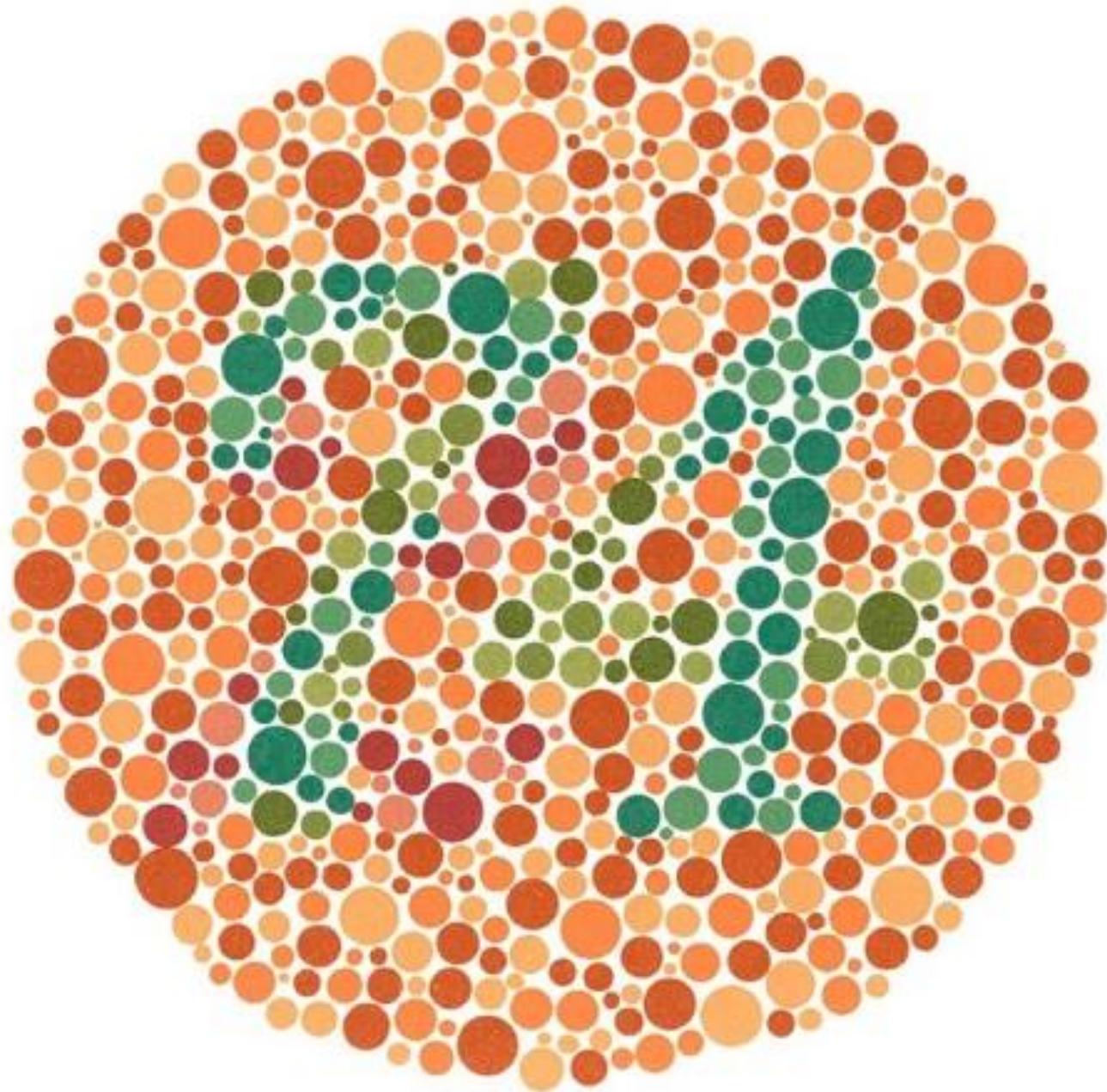


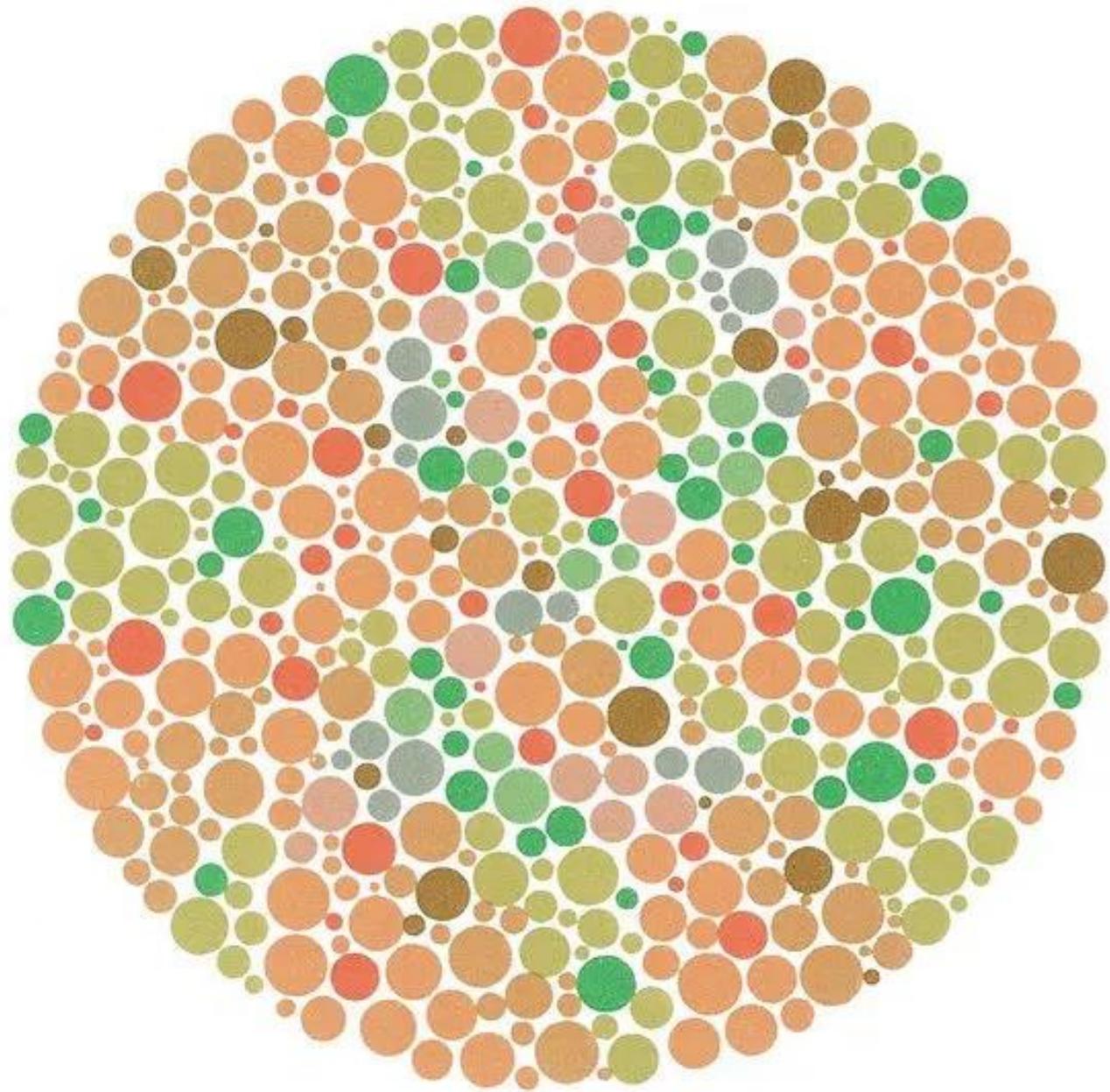
# How to use Ishihara plates

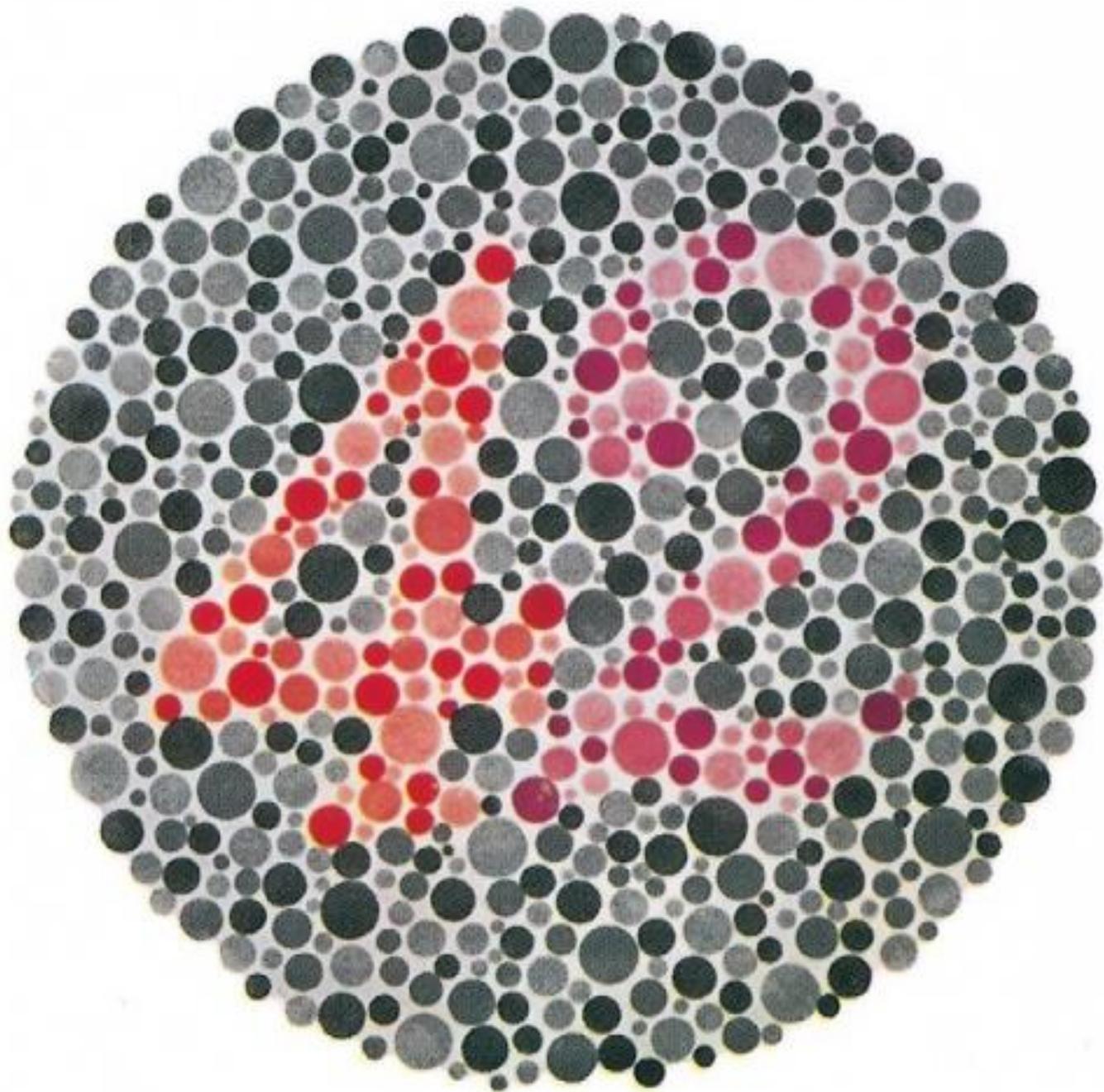
- If the patient normally wears glasses for reading, ensure these are worn for the assessment.
- Test each eye individually and ensure there is enough sunlight in the room.
- The patient is asked to look at the plates and report the number they see.
- The first page is usually the 'test plate' which does not test colour vision and instead assesses contrast sensitivity.
- Individuals with normal color vision see the correct number, while those with a deficiency see a different number or see nothing at all.
- <https://www.youtube.com/watch?v=J8MGa4hqvCU&list=PLwYICl63HBzkXbEb6dDJBb0mP8o--91ox&index=10>











# Assessing hearing

- Types of hearing loss :

1. Conductive hearing loss: occurs when there is an obstruction or damage to the outer or middle ear that prevents sound from being conducted to the inner ear.

- ✓ Causes include excessive ear wax, otitis externa, otitis media, and perforated tympanic membrane

2. Sensorineural hearing loss: impairment of the cochlea or the vestibulocochlear (VIII) nerve.

- ✓ Causes include aging, excessive noise exposure, genetic mutations, viral infections and ototoxic agents

- Hearing can be assessed by subjective methods such as Rinne and Weber tests, or by objective methods such as an audiometry test

# Rinne and Weber tests

- These tests are designed to evaluate hearing
- Useful, quick, and simple screening test for evaluating hearing loss.
- They are screening tests and do not replace formal audiometry.
- We use a 512 Hz tuning fork
  - It has a long period of tone decay (tone lasts long after the tuning fork has been struck) and can't be detected by the sense of bone vibration, therefore preventing misinterpretation of the vibration as sound.
- <https://www.youtube.com/watch?v=sJBpai74tIU>
- 8:35- 9:20

# Rinne Test

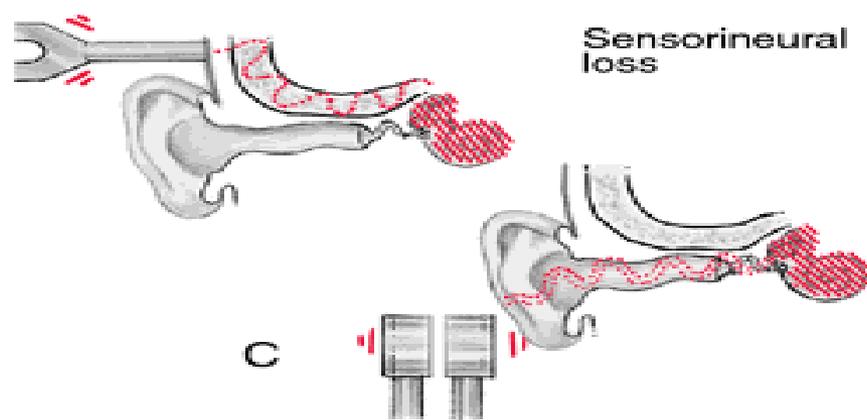
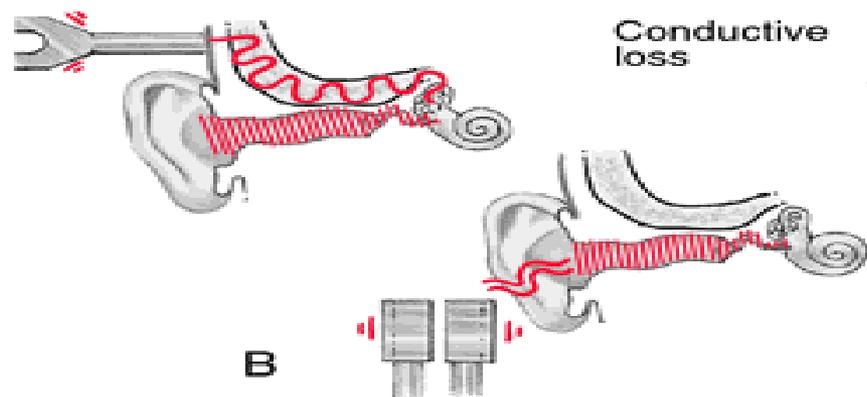
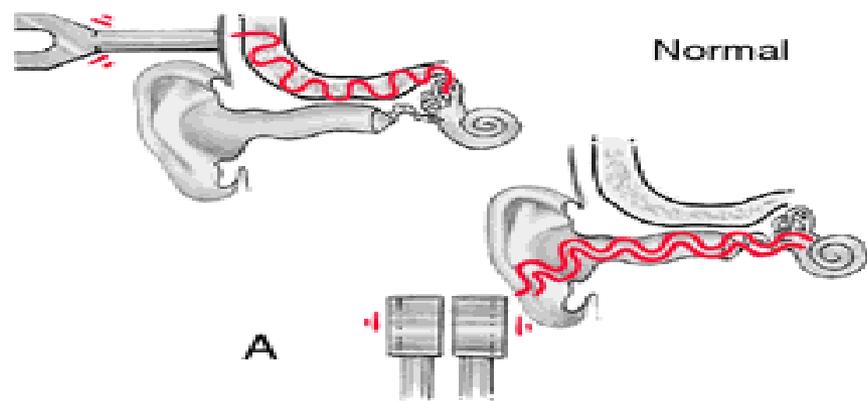
- Strike the tuning fork against a firm but the elastic object (e.g., the clinician's knee or elbow).
- Place the vibrating tuning fork firmly on the mastoid process.
- Confirm the patient can hear the sound of the tuning fork and then ask them to tell you when they can no longer hear it.
- When the patient can no longer hear the sound, move the tuning fork in front of the external auditory meatus to test air conduction.
- Ask the patient if they can now hear the sound again.



# Results interpretation

- Normal : air conduction is better than bone conduction
- Sensorineural deafness: air conduction is better than bone conduction (both air and bone conduction are reduced equally).
- Conductive deafness: bone conduction is better than air conduction

# Rinne Test

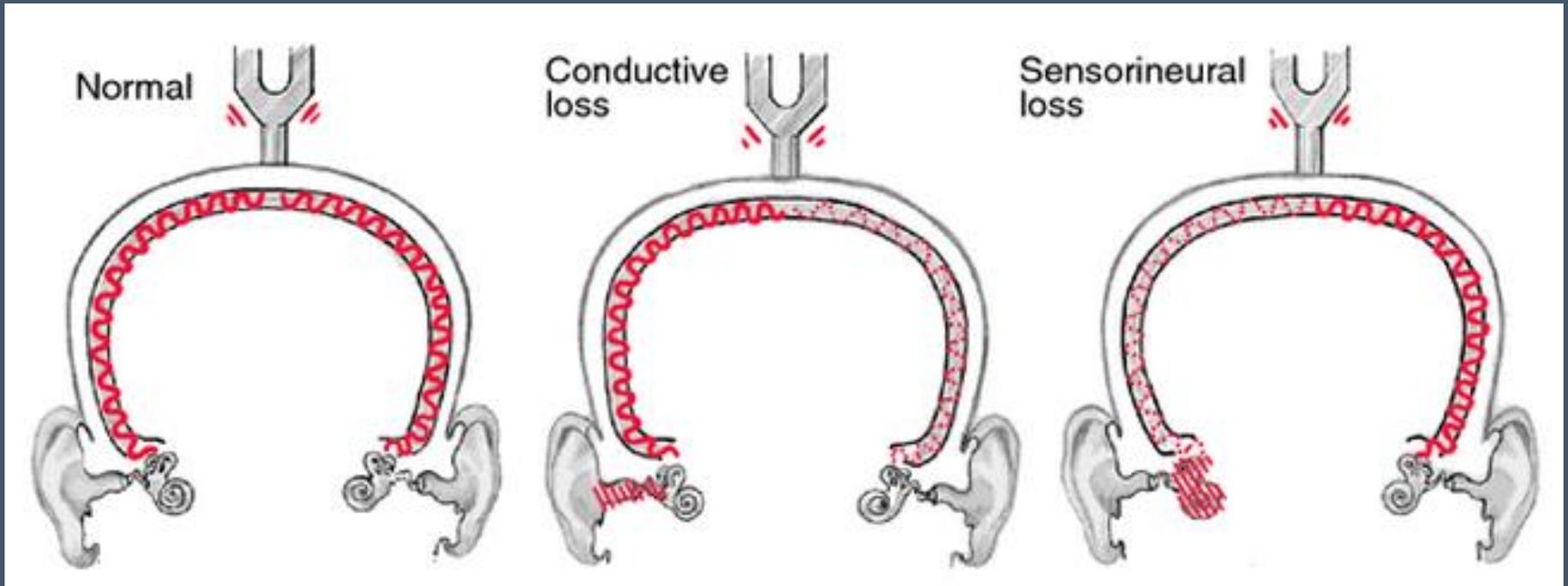


# Weber Test

- The vibrating tuning fork is placed on the vertex of the skull or the forehead in the midline, and the patient is asked to report the side where the tone sounds louder.
- Normally, the tone sounds equal on both sides.
- In conductive hearing loss, the tone is louder on the affected side.
- In sensorineural hearing loss, the tone is louder on the normal side.

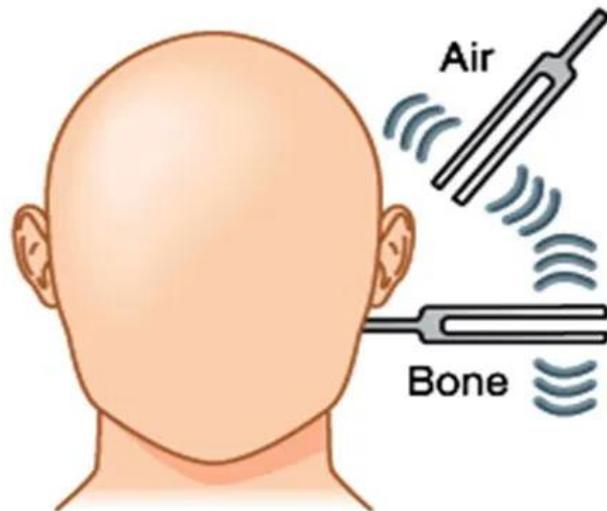


# Weber Test

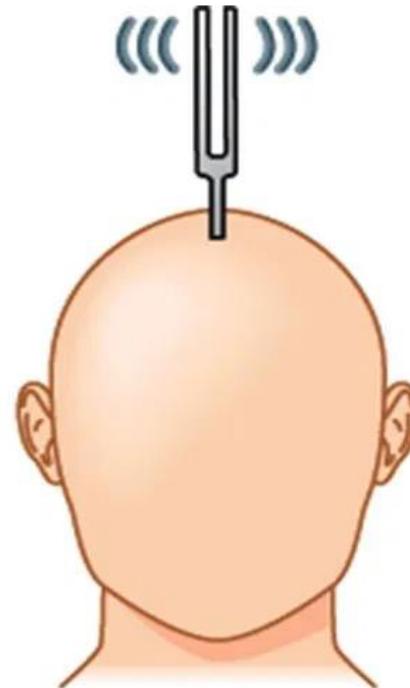


# TEST RESULTS

## Rinne and Weber tests



Rinne test



Weber test

Hearing loss	Rinne test (Conduction)	Weber test (Localization)
None	Air > bone	Midline
Sensorineural	Air > bone	Normal ear
Conductive	Bone > air	Affected ear

Thank you