

Snellen chart

Snellen chart



Snellen chart is an eye chart that measures a person's vision by how well they can read and see detail. Dr. Herman Snellen, a Dutch eye doctor, created the eye chart in 1862 for his colleague

Snellen chart

Dr. Snellen created his chart using a geometric scale that gives an exact measurement of a person's visual acuity. The chart has 11 lines of capitalized block letters, known as **optotypes**.

At the top of the chart is only one letter — a large “E.” As you move down the rows of the chart, the letters gradually get smaller.

Description

The normal Snellen chart is printed with eleven lines of block letters. The first line consists of one very large letter, which may be one of several letters, for example E, H, or N. Subsequent rows have increasing numbers of letters that decrease in size. A person taking the test covers one eye from 6 metres or 20 feet away, and reads aloud the letters of each row, beginning at the top. The smallest row that can be read accurately indicates the visual acuity in that specific eye. The symbols on an acuity chart are formally known as "optotypes".

Description



the thickness of the lines equals the thickness of the white spaces between lines and the thickness of the gap in the letter "C"

the height and width of the optotype (letter) is five times the thickness of the line


Description

Only the nine letters C, D, E, F, L, O, P, T, Z are used in the common Snellen chart. The perception of five out of six letters (or similar ratio) is judged to be the Snellen fraction. Wall-mounted Snellen charts are inexpensive and are sometimes used for approximate assessment of vision, e.g. in a primary-care physician's office. Whenever acuity must be assessed carefully or where there is a possibility that the examinee might attempt to deceive the examiner (as in a motor vehicle license office).

Snellen fraction



Visual acuity is the distance at which test is made / distance at which the smallest optotype identified subtends an angle of five arcminutes and the critical distinguishing features of the optotype subtend an angle of one arcminute

"6/6"(m) or "20/20"(ft) vision 

"6/6"(m) or "20/20"(ft) vision


Snellen defined "standard vision" as the ability to recognize one of his optotypes when it subtended 5 minutes of arc. Thus the optotype can only be recognized if the person viewing it can discriminate a spatial pattern separated by a visual angle of one minute of arc. □

Outside the United States, the standard chart distance is 6 metres (20 ft), and normal acuity is designated "6/6". Other acuities are expressed as ratios with a numerator of 6. Some clinics do not have 6-metre eye lanes available, and either a half-size chart subtending the same angles at 3 metres (9.8 ft), or a reversed chart projected and viewed by a mirror is used to achieve the correct sized letters □

. "6/6"(m) or "20/20"(ft) vision

In the most familiar acuity test, a Snellen chart is placed at a standard distance: 6 metres. At this distance, the symbols on the line representing "normal" acuity subtend an angle of five minutes of arc, and the thickness of the lines and of the spaces between the lines subtends one minute of arc. This line, designated 6/6 (or 20/20), is the smallest line that a person with normal acuity can read at a distance of 6 metres

Electronic chart

To ensure adequate illumination of the Snellen  charts, various medical device manufacturers had developed Snellen chart products with backlight or projection.

Digital chart

Since computer monitors typically have good □ lighting for reading and LCD/LED monitors have high DPI (between 96 and 480) they are suitable for displaying optotypes. Commonly digital chart products support randomizing optotypes displayed.



TRIAL CASE 1

TRIAL CASE

·
Trial box is a box containing lenses, arranged in pairs , a trial spectacle frame, and other devices used in testing vision. It is also called as a trial case

TRIAL CASE CONSIST OF

Trial frame ☐

Trial lens ☐

Prism ☐

Accessories ☐

Uses of trial box

Objective refraction ☐

Subject refraction ☐


Diplopia charting ☐

Diagnosis of squint ☐

Assess binocular vision ☐

Trial frame:



Trial frame an eyeglass frame designed to permit 
insertion of different lenses used in correcting
refractive errors of vision

Features:

Light weight ☐

Adjustable ☐

It should have comfortable nose resting ☐

Readily adjustable and allow accurate centering ☐
vertically and horizontally for each eye.

Compartments of trial frame

3–4 compartments □

1st— High powered lens □

2nd— spherical lens □

3rd— cylindrical lens □

4th— accessory lens and prisms □

Cylindrical lens compartment should be capable of smooth and accurate rotation . □

Trial frame should be easy to adjust of both PD and corneal alignment while providing a sure mounting for trial lens. □

COMPARTMENTS OF TRIAL FRAME

- 3-4 compartments
- 1st - High powered lens
- 2nd - spherical lens
- 3rd - cylindrical lens
- 4th - accessory lens & prisms



Types of frame



Full aperture frame ☐

Reduced aperture frame ☐

Half eye trial frame ☐

. Full aperture frame

Accommodates up to five 38mm lens for each eye □

Independent screw adjustments for PD of 48 to 80mm □

Screw operated bridge height and projection □

Slides adjustable for length and angle □



Reduced aperture frame

Skeoch reduced aperture trial frame □

A very durable lightweight drop cell trial frame. □

It holds up to four 38mm lenses for each eye □

Accessories may be easily inserted and extracted □



Half eye trial frame

Half eye trial frame with nosepiece , child. □

As half eye trial frame with PD of 54 to 58mm. □

Also available with fixed bridge or adjustable nosepiece. □

Available for adults with PD 59 to 67mm □



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TRIAL CASE 2

Trial lens:

- □

During refraction the practitioner utilize a set of □
know lenses called as trial lenses

Types of lens

Full aperture lens ☐

Reduced aperture lens ☐

Spherical lenses ☐

Cylindrical lenses. ☐

Full aperture lens

- Approximately 38mm diameter. □
- Biconvex or biconcave form. □
- They do not confirm any of the additive lens principles . □
- Preferred by many practitioner. □
- Do not obscure patients face. □
- Disadvantage: heavier and thicker , large additive errors □



Reduced aperture lens

Lenses of 20mm diameter mounted in the metal rim of 38mm diameter □

Plano convex and plano concave □

Used for refraction and neutralization . □

For refraction, curved surface should face the eye. □

For neutralization, curved surface of the trial lens is placed against to the curved surface of spectacle lens. □



Spherical lenses

- All meridians have same power □

There are 32 pairs of spherical lens in plus and minus power □

Reduced and full aperture are available. □

Spherical lenses

Power range in spherical: ☐

Pair of positive lenses ranging +0.12 to +20.00D ☐

Pair of negative lenses ranging -0.12 to -20.00D ☐

Uses: ☐

For spherical ametropia . ☐

For hand neutralization. ☐

Checking the refracting error. ☐

Cylindrical lenses



- Power lies in one meridian. □

Axis meridian is marked on rim of the lenses. □

19 pairs of cyl lenses □

. Cylindrical lenses

Pair of positive lenses ranging +0.12 to +6.00D □

Pair of negative lenses ranging -0.12 to -6.00D. □

Uses: □

For correction of astigmatism. □

For checking the refractive error . □

Prism

Prism is a refractive medium having two plane surfaces inclined at an angle. □

Principle : 1 prism dioptres produces displacement of the image at 1cm when the object is situated at the distance at 1m. □

Produces prismatic effect. □

Power OF PRISM :

Power range of: ☐

1/2 (0.5)D ☐

1–6.00D in 1D steps ☐

6–12.00D in 2D steps ☐

1–6.00D in 1D steps ☐

6–12.00D in 2D steps ☐

USES OF PRISM

To correct and measure strabismus. □

Exercising prism □

Measure the fusional range. □

For the measurement and correction of the angle of deviation. □

It is also used in instruments like gonioscopy, □
keratometer, slit lamp, and applanation tonometer

Accessories:

Plano lens ☐

Red and green filter ☐

Maddox rod ☐

Stenopaic slit ☐

Occluder ☐

Pin hole ☐

Jackson cross cylinder ☐

Near vision chart ☐

Plano lens

□ Zero Power. □

It is used for satisfy and identify the malingering □
patients.

Occluder:

□ It is a opaque plastic disc □

Occlude one eye □

To relax accommodation □

Used to dissociate fusion and used to close one eye □
while the other eye can be tested for visual acuity



Pin hole disc

- Opaque disc with pinhole of 1–2mm diameter in its centre □
- Allows only a pencil of light pass through the corneas. □
- Help to determine whether eye has refractive or pathological errors. □
- Pinhole of 1.32mm is more effective. □
- Usually available pinhole is 1mm in ordinary trial case. □

Pin hole disc

Principle: pinhole creates a smaller blur circle on retina and thus improve the v/A . □

It gives clue about potential visual acuity. □

To find out if the loss of vision is due to an error of refraction or some organic lesion or a combination □

PIN HOLE



Maddox box

It is made up of several series of high plus plano cylindrical lenses. □

Patient sees streak of light through this lens. □

Available in red and white in colour. □

Used a single and double Maddox rod depends upon the test. □

USES

- To detect heterophoria □
- To detect cyclophoria □
- To measure the squint deviation □
- To detect orthophoria □



Near vision chart

It is was introduced by snellen. □

It is a photographic reduction of snellen's distant □
chart.

Uses: □

Mainly used for visual acuity. □

Also used to measure the near point of □
accommodation.

Stenopaeic slit

It has a slit of 1mm width and 25mm in length. □

It allows strip of light to pass through the corneas . □

Uses: □

To find out axis of cylinder + or— □

Emsley fincham test. □

To find out whether patient is having astigmatism. □

Vertex distance also measure. □



Red and green filter:

Red in RE and green in LE . ☐

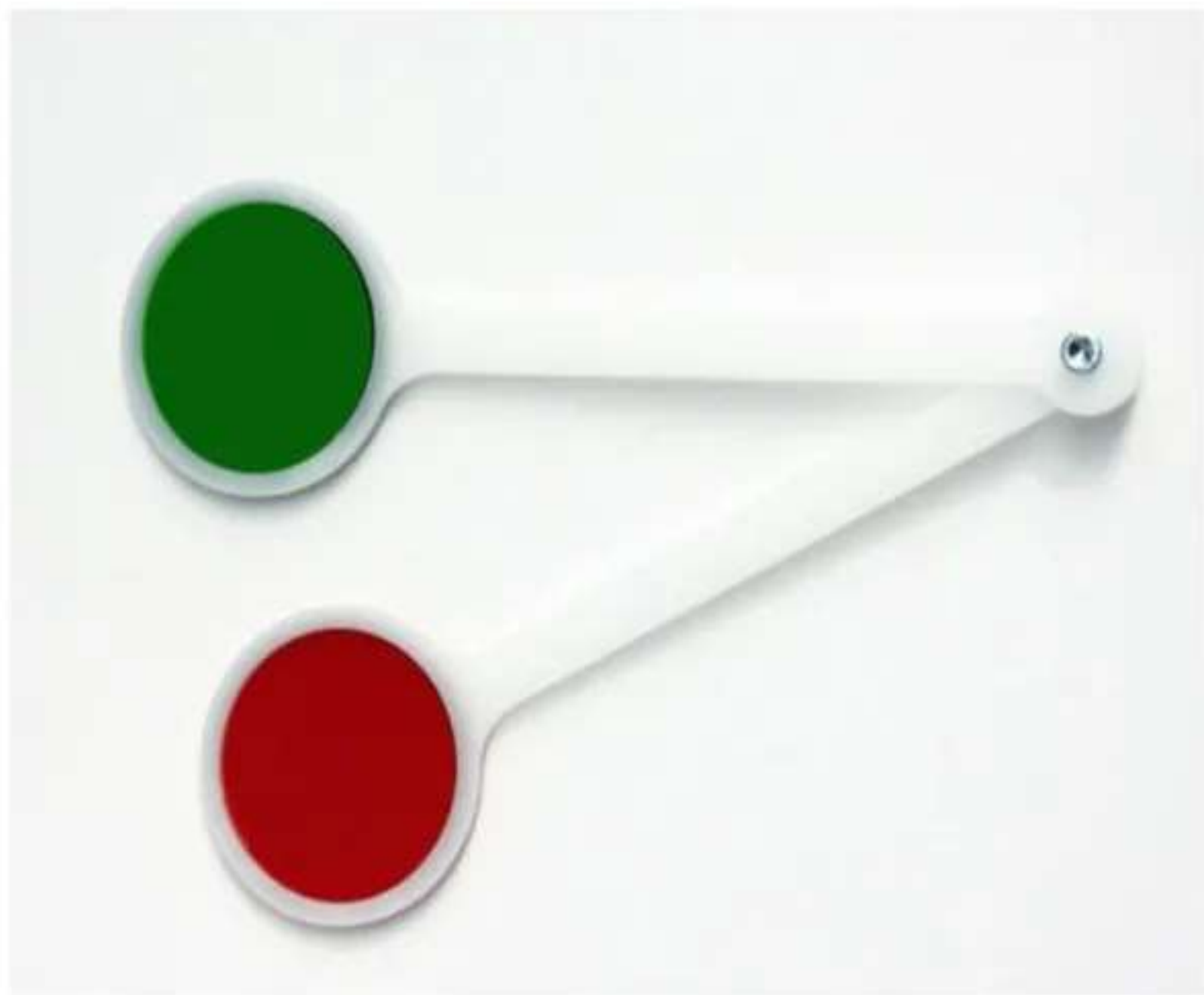
Used for colour dissociation ☐

Used to find out suppression of eye. ☐

To find out diplopia. ☐

To do worth 4 dot test and friend test. ☐

Used to measure the fusion , squint. ☐



Jackson cross cylinder

It is a combination of plus cyl and minus cyl 90° apart. □

Handle is located at 45° between two axis. □

Principle: spherical equivalent is zero. □

Used to determine both power and axis of the astigmatic correction. □

Uses

- For the subjective verification of refraction. □
- To find out exact axis of astigmatism. □
- To check presbyopic adds. □
- To check amplitude of accommodation. □

CROSS CYLINDER





Prisms and lenses

Prism

is a transparent triangular piece of glass or plastic □

□


It has with two plane (flat) refracting sides an apex (top) and base (bottom). a ray of light incident to a prism is always bent toward the base of the prism. the image formed appears displaced toward its apex.

□

The magnitude of prism effect depends on the angle of the prism □

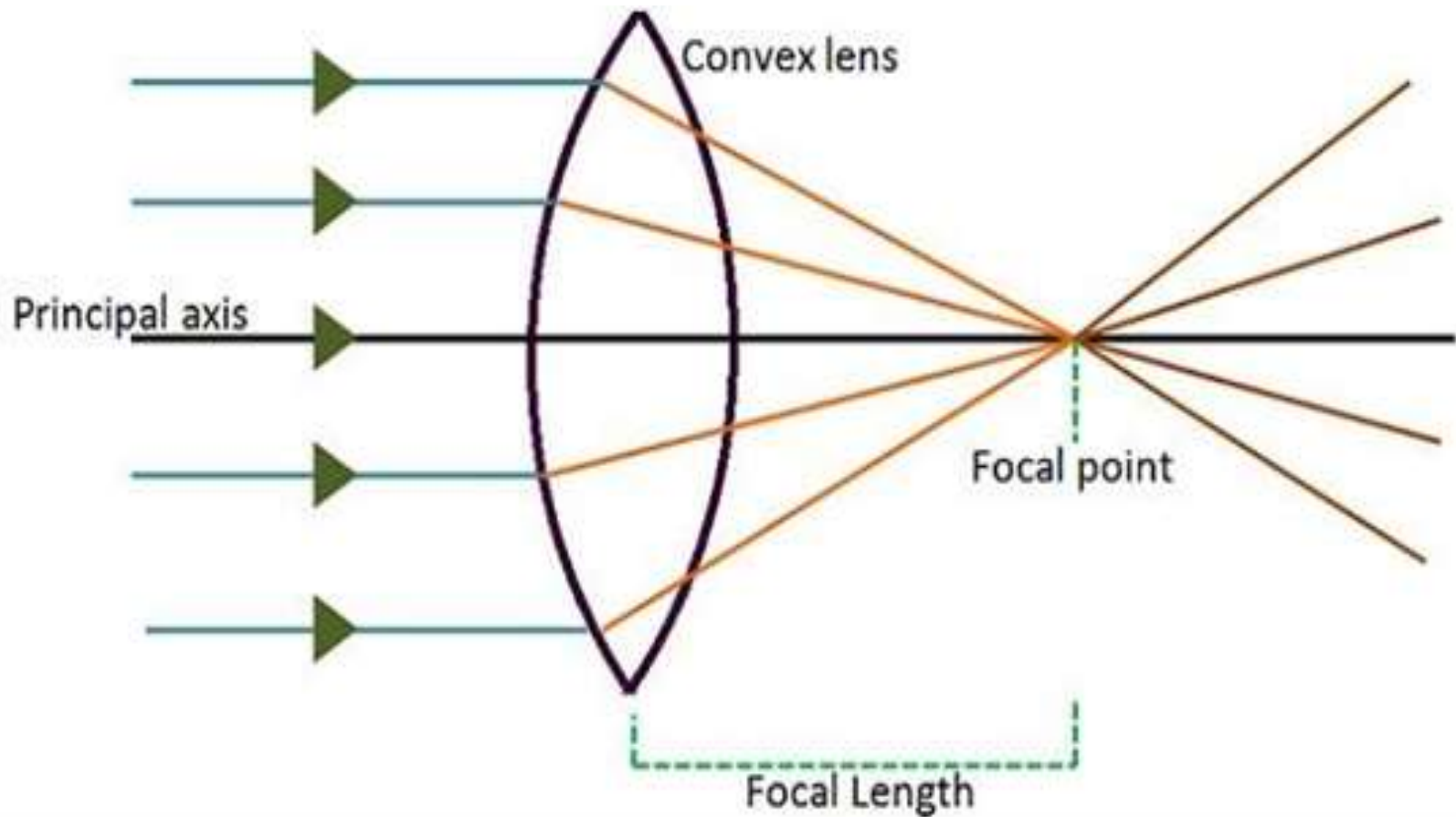


Lens

It is transparent medium bounded by two  curved surfaces or one curved surface and plane surface .it I s most common application is correcting certain problem in eye sight.

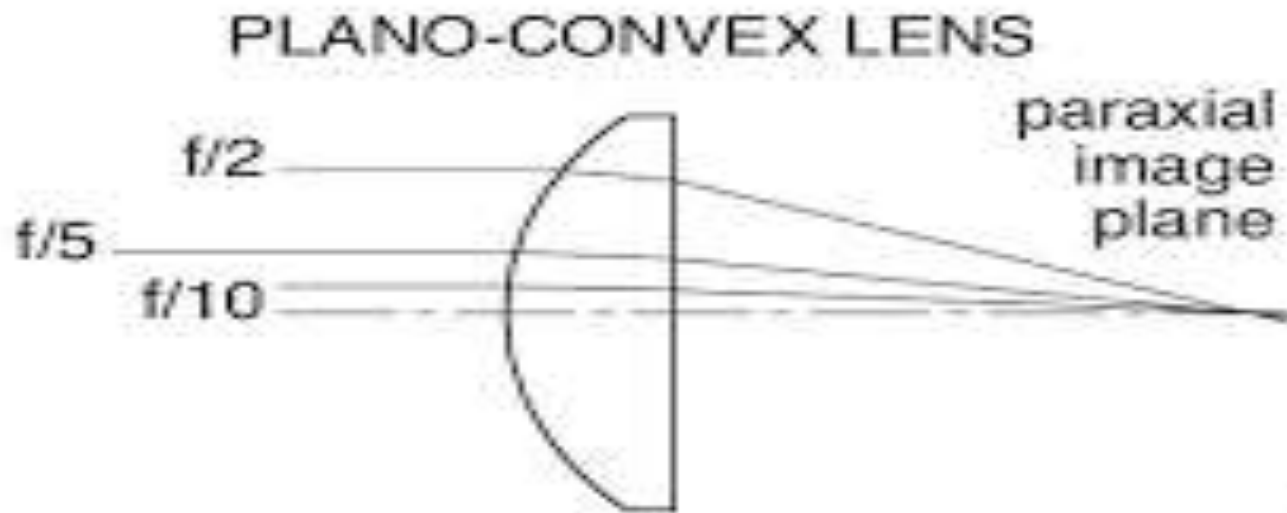
Type of lenses

1-bi convex lens—both side are convex □



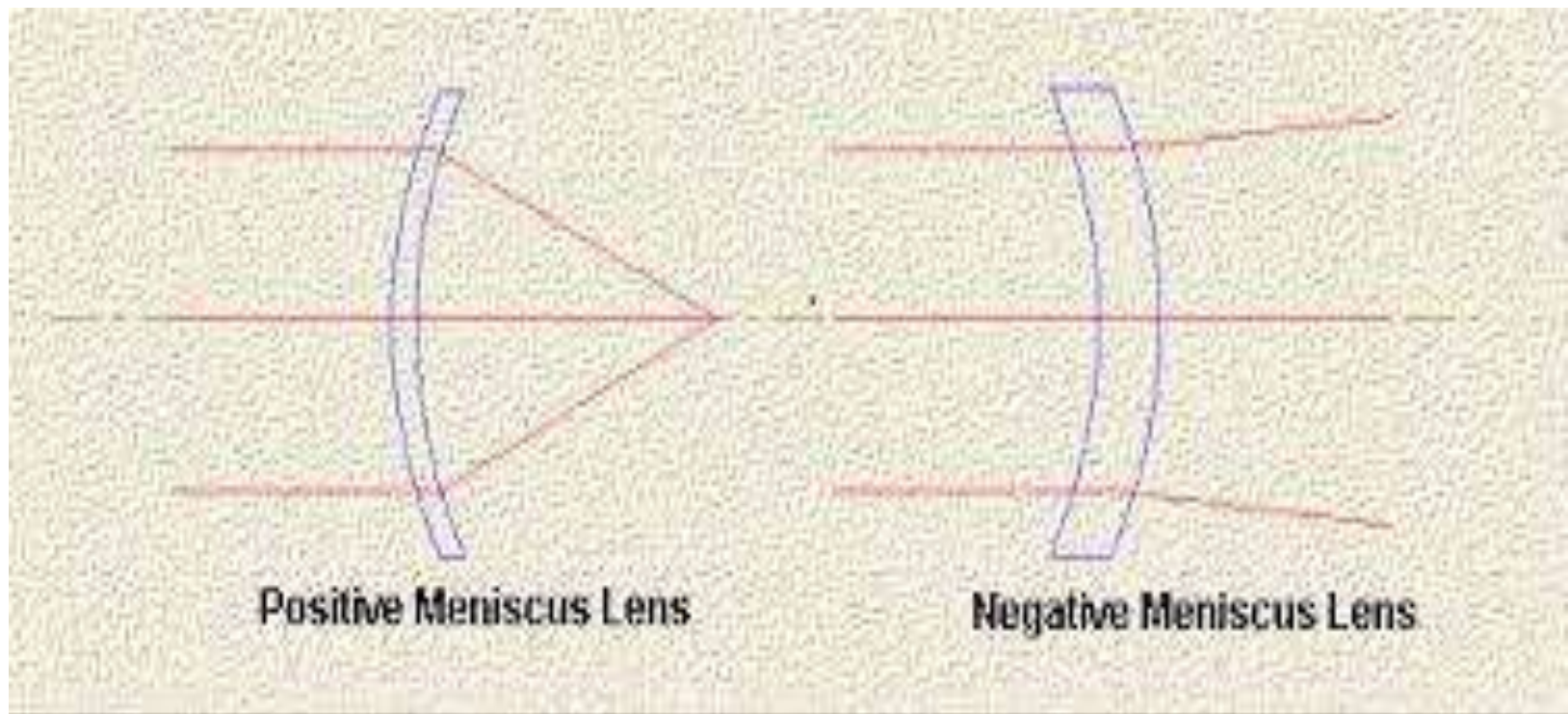
Type of lenses

2- Plano-convex lens—one side is plane and other side is convex □



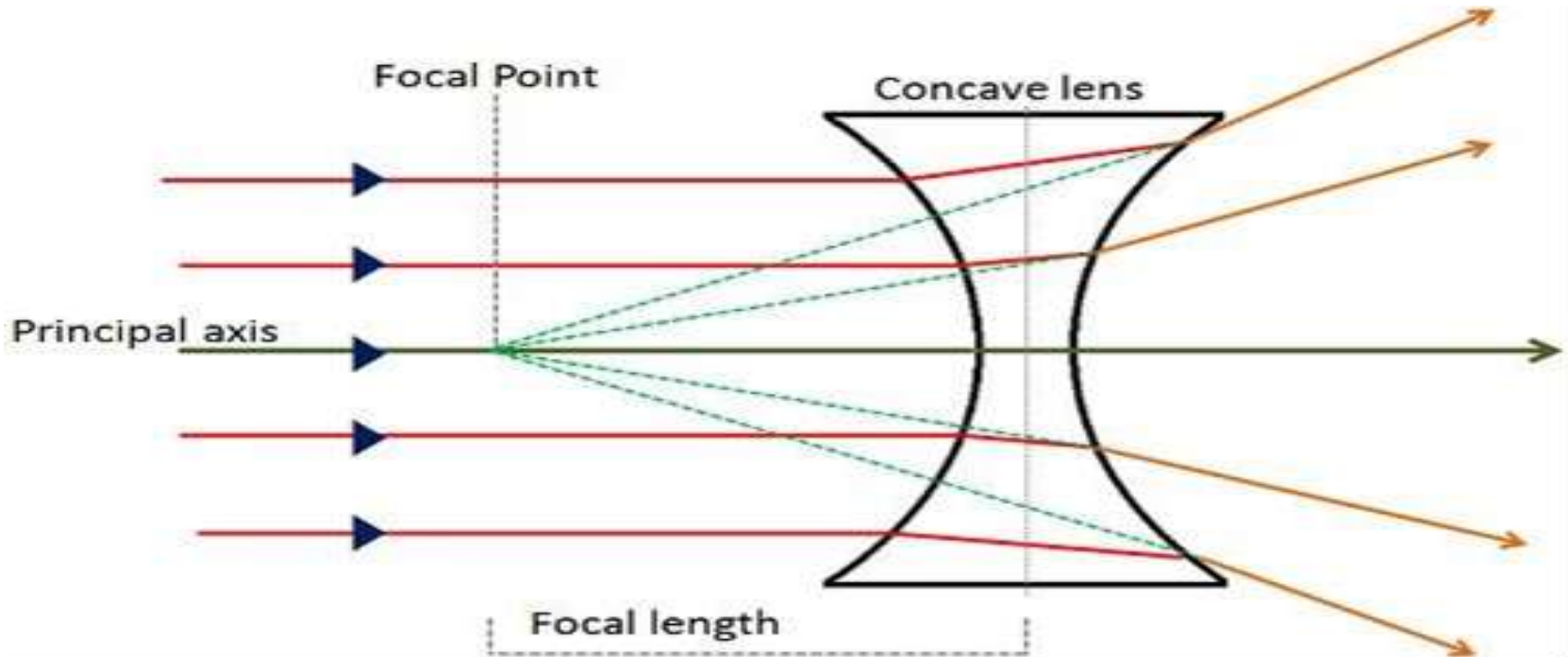
Type of lenses

3-meniscus lens—convex meniscus .meniscus □
shape with greater convex curvature



Type of lenses

4-bi concave lens—both side are concave □



Type of lenses

5- Plano–concave lens—one side is plane □
and other side is- concave.

□

6-meniscus lens–concave meniscus □
,meniscus with great concave curvature.

Mechanism

To understand the working of lenses consider ☐
two prism placed base to base .the light rays
through them coverage (come together)

☐

☐

At same point on the other side of prism. ☐

☐

If two prism are placed together apex to apex ☐
the ray will be diverge(spread apart)on the
other side of the prism

Mechanism

And Most application of curved surface lenses are ☐
spherical lens lenses that converge a beam of light
known as converging lens convex or positive
lenses

While those that diverge a beam of light known as ☐
diverging ,concave or negative lenses



Lensometer 1

Lensometer

A focimeter is a device used to determine the power of a lens. It is also known variously as a lensometer or vertometer. It can determine the spherical power, cylindrical power, axis, prism and the position of the optical center of a lens. In Figure 1, the labelled parts of the focimeter are

PARTS

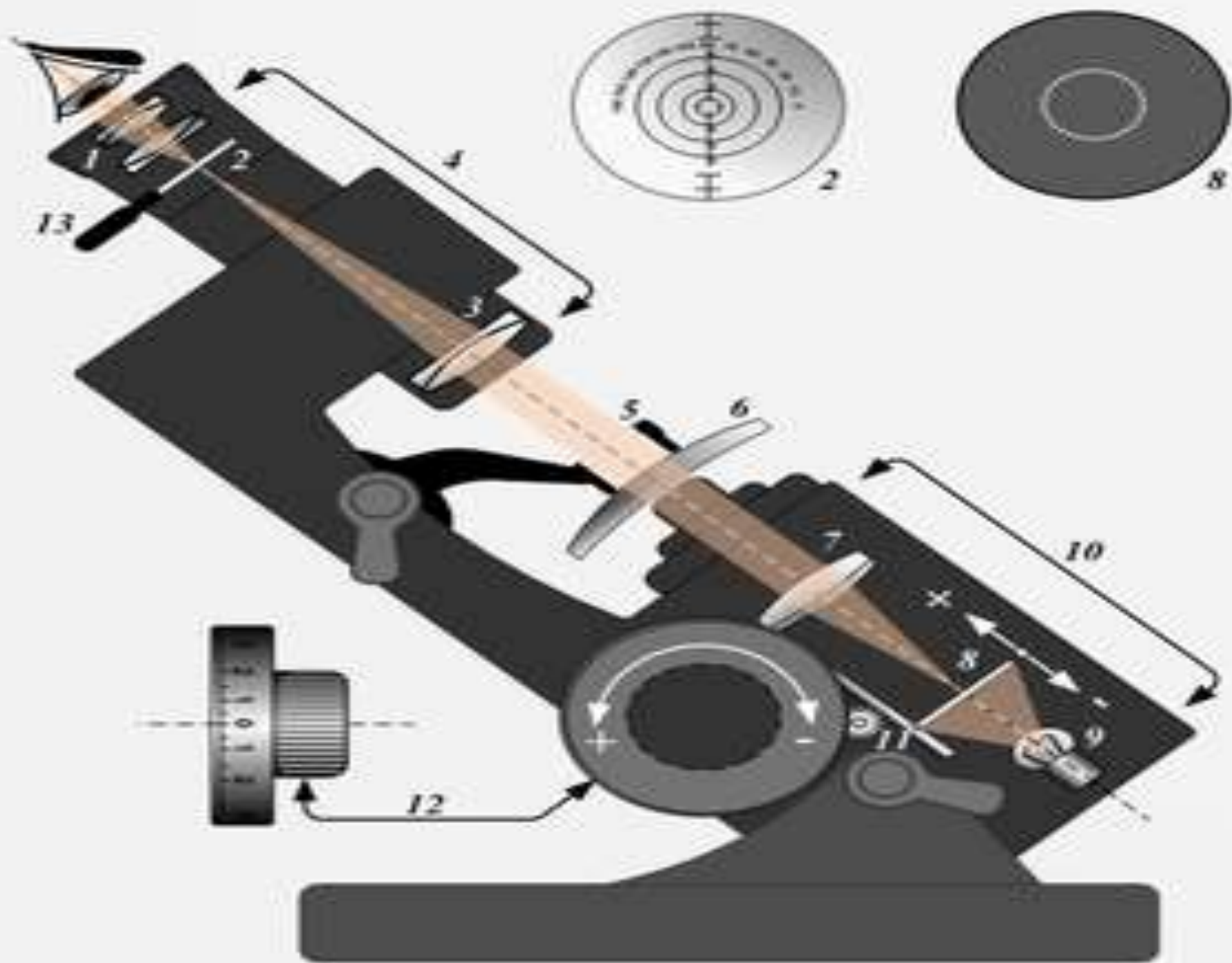
1. Eye piece ☐
2. Reticule adjustment ☐
3. Prism compensator ☐
4. Lens marker ☐
5. Gimbal (lens holder) ☐
6. Eyeglass table ☐



PARTS

- 7. Magnifier ☐
- 8. Axis adjustment knob ☐
- 9. Filter control ☐
- 10. Inclination control ☐
- 11. Power drum ☐
- 12. Eyeglass table control ☐





steps in using a focimeter

1. Get Comfortable ☐
- . 2. Focus the Eyepiece ☐
- . 3. Check Power Calibration ☐
4. Position the Spectacle Frame ☐
5. Mark the Optical Centre ☐
6. Determine the Right Lens Power ☐
7. Determine the Left Lens Power ☐
8. Determine the Prism ☐

1. Get Comfortable

Position the focimeter at a comfortable angle for viewing by using the locking lever or inclination control at the side of the instrument to adjust the tilt of the focimeter. This is also a good time to ensure the prism compensator is at 0. □

Focus the Eye piece

as viewed through eye piece It is essential to focus the eyepiece for your eye if someone else has used the focimeter before you. The video in the Multimedia Tab of this article called 'Setting up a Focimeter' demonstrates how to focus the eyepiece. The steps are: □

Focus the Eyepiece

- Keep the focimeter power off. □
 - Rotate the eyepiece counter-clockwise until the reticle is blurred. A white card or piece of paper held behind the eyepiece may make the reticle lines more visible. □
 - Turn the eyepiece clockwise until the reticle is just clear. The lensometer is now adjusted for your eye. □
- Note: Do not turn past the point at which the reticle is first clear.



. Check Power Calibration

Ensure the power calibration of your focimeter is accurate. This should be done occasionally. ☐

- Turn the focimeter on. ☐
- Turn the power wheel into the plus, then slowly decrease the power until the focimeter target is sharply focused ☐

Check Power Calibration

Do not oscillate the wheel back and forth to find the best focus. The power wheel should read zero if the instrument is in proper calibration. □

- If the power wheel does not read zero, re-focus the eyepiece and re-check the calibration. If the power wheel still does not read zero, the error must be compensated for on all future measurements made with the lensometer, or the lensometer needs maintenance. (Note: algebraically subtract the calibration error from the power measurement to compensate for calibration errors.) □

Position the Spectacle Frame

Turn the spectacles so that the front of the spectacles is facing towards you. The temples (the arms of the spectacle frame) should be pointing away from you. □

- Put the spectacles on the frame table. The bottom rim of the spectacles should rest on the frame table. □

- Clamp the spectacle lens to keep it pressed against the lens rest. □

Note: always start with the right lens (for consistency) □




Lensometer 2

Position the Spectacle Frame

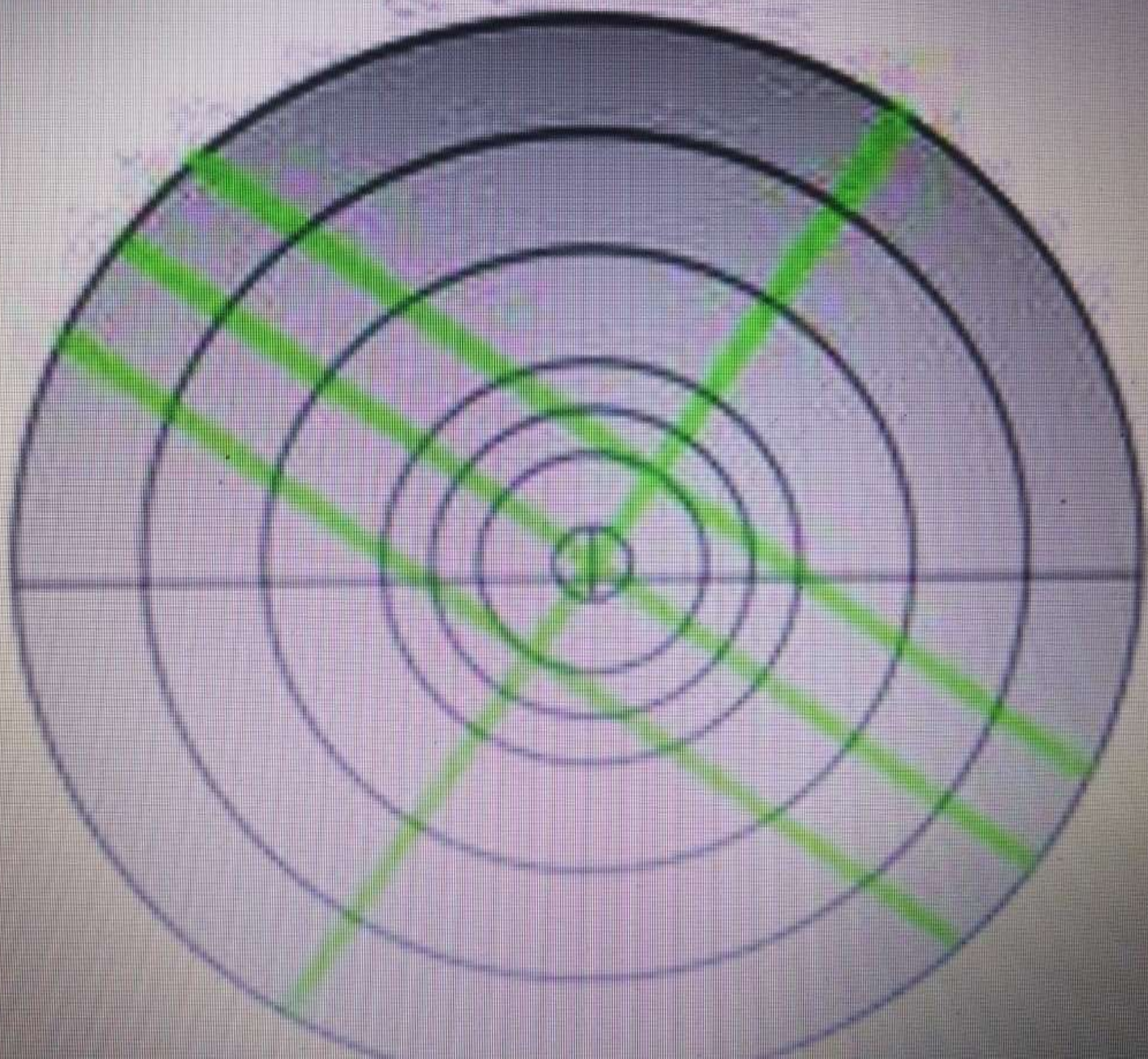
- Look through the eyepiece and move the spectacles side-to-side and up-and-down until the target is in the centre of the black graticule. □
- Change the height of the frame table to keep the frame horizontal in this position (that is, with the bottom rims of the spectacle against the table to make sure one side does not drop down) □

Mark the Optical Centre

When the lens is positioned as above - where the  centre of the focimeter target is over the centre of the graticule - then you are at the optical centre of the lens. Note: if there is a ground prism in the lens, despite movements of the lens up-and-down or side-to-side, the focimeter target will not be centred over the graticule - so there is no optical centre of such a lens.

Mark the Optical Centre

Mark the optical centre. Focimeters usually have an ink well and marking pins. When the lens is centred correctly, you can use the marking pins to put a mark (usually small dots) on the lens surface. If the vertometer does not have an ink well or marking pins, you can use a marking pen (felt tipped pen) to mark the optical centre of the lens yourself. You will need to make the mark on the lens directly over the lens rest



Determine the Right Lens Power

- With the right lens positioned at its optical centre, turn the power wheel to a high plus reading. □
- Slowly decrease the power (reduce the plus by turning the power wheel) until the target lines just become clear □
 - a. If the Lens is a Sphere: □
 - All the target lines will come into focus at the same time □
 - Simply read off the power drum to determine the spherical power □
 - b. If the Lens is Astigmatic: □
 - Only some of the lines are clear at a given power □

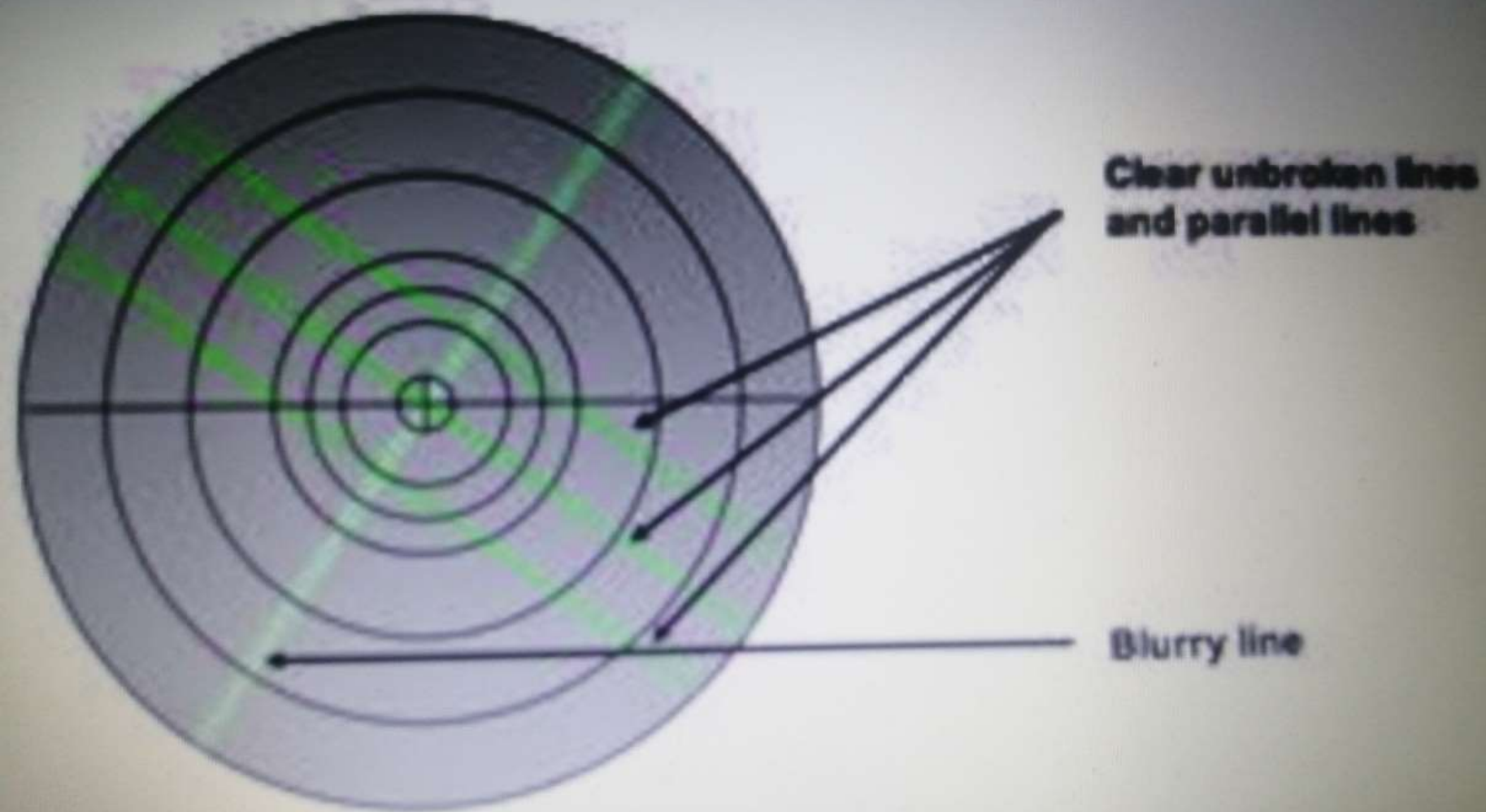
Determine the Right Lens Power

- Turn the power wheel to a high plus reading and slowly decrease the power until some of the target lines just become clear. □
- Turn the axis wheel until the three parallel target lines are straight and unbroken □

Determine the Right Lens Power

- The number on the power wheel at this point is the most positive meridian of the lens. This will be the spherical power when you write the astigmatic lens prescription. □
- Slowly turn the power wheel to decrease the power until the other line is clear. The number on the power wheel will now tell you the power of the least positive meridian of the lens. □
- Find the cylindrical power of the lens: this is the difference in powers, ie the more positive power subtracted from the more negative power (negative cylinder) □

- Find the axis of the cylinder. The axis of the cylinder is the direction of the second power reading, ie the least positive power. The direction of this line is measured by aligning the graticule and looking at the axis numbers on the graticule inside the eyepiece. □
- Example: Reading 1 is +3.00D x 90 and Reading 2 is +2.00D x 180. The lens is: +3.00/-1.00 x 180 □



. Determine the Left Lens Power

- Without changing the height of the lens table, clamp the left lens in position □
- Centre the lens by moving it left-and-right as appropriate □
- There should be no need to move the lens up-and-down: the focimeter target should be vertically aligned with the graticule at the table height used for the right lens. If it is not, then there is vertical prism between the lenses, which can be measured by the markings on the graticule. □
- Once aligned at the optical centre, mark the optical centre of the left lens and measure the power of the left lens using the same steps as for the right lens above. □

Determine the Prism

a. Vertical Prism ☐

---If the focimeter target (the green cross) is not centred vertically about the reticule, then there is vertical prism present ☐

--- If the focimeter target is below the horizontal then there is base down prism ☐

--- If the focimeter target is above the horizontal then there is base up prism ☐

☐ The size of the prism can be read from the reticle markings ☐

. ☐

Determine the Left Lens Power

□ Note: this method determines the total vertical prism between the two lenses. In order to determine the precise contribution of the left and right lenses to the total prism it is necessary to know the position of the patient's pupils relative to the optical centres of each lens. In practice, the total vertical prism is usually divided evenly between the two lenses

Determine the Prism

b. Horizontal Prism ☐

- Mark the optical centres of each lens ☐
- Determine the patient's inter-papillary distance ((IPD ☐
- Mark the left lens at the IPD distance away from the optical center of you made on the lens is over the center of the lens rest ☐
- Clamp the left spectacle lens on the lens rest so that the PD mark that ☐

Determine the Prism

---- Measure the horizontal prism and direction using the □
:reticule. This is the total horizontal prism. Remember that

o if the target is to the left (nearer the right lens) the prism □
is

base-in □

o if the target is to the right (away from the right lens) the □
prism

is base-out □

Determine the Prism

□ Note: this method determines the total horizontal prism between the two lenses. In order to determine the precise contribution of the right and left lenses to the total prism it is necessary to know the position of the patients pupils relative to the optical centers of each lens .in practice ,the total horizontal prism is usually divided evenly between the two lenses □

Determine the Near Add

□ Turn the spectacles around. The near addition is □
a measure of the front vertex power - as opposed to
the distance prescription which is a measure of
back vertex power. It is therefore necessary to turn
the spectacles around so that the arms of the
spectacles point towards you

Determine the Near Add

- Measure the power of the distance section and □
compare this to the power of the near section - the
difference is the near addition
- For astigmatic lenses, simply compare one □
meridian in the distance to the equivalent meridian
in the near - again the difference is the near add



LOSS OF VISION

LOSS OF VISION

- Loss of vision is considered sudden if it develops within a few minutes to a couple of days. It may affect one or both eyes and all or part of a field of vision.

Causes

- Clouding of normally transparent eye structures
- Abnormalities of the retina (the light-sensing structure at the back of the eye)

Abnormalities of the nerves that carry visual signals from the eye to the brain (the optic nerve and the visual pathways)

How and Why Blindness Develops

- Damage to the cornea caused by infections such
- as herpes keratoconjunctivitis or an infection
- that follows contact lens overwearing, which
- results in an opaque corneal scar
- Damage to the cornea caused by vitamin
- A deficiency (keratomalacia), which causes dry
- eyes and results in an opaque corneal scar (rare in developed nations)
- Damage to the cornea caused by a severe injury
- that results in an opaque corneal scar
- A cataract, which causes loss of clarity of the lens

Light rays do not focus on the retina clearly.

- Imperfect focusing of light rays on the
- retina (refraction errors) that cannot be
- fully corrected with eyeglasses or contact
- lenses (such as from certain types of
- cataracts

The retina cannot sense light rays normally.



- Detached retina
- Diabetes mellitus

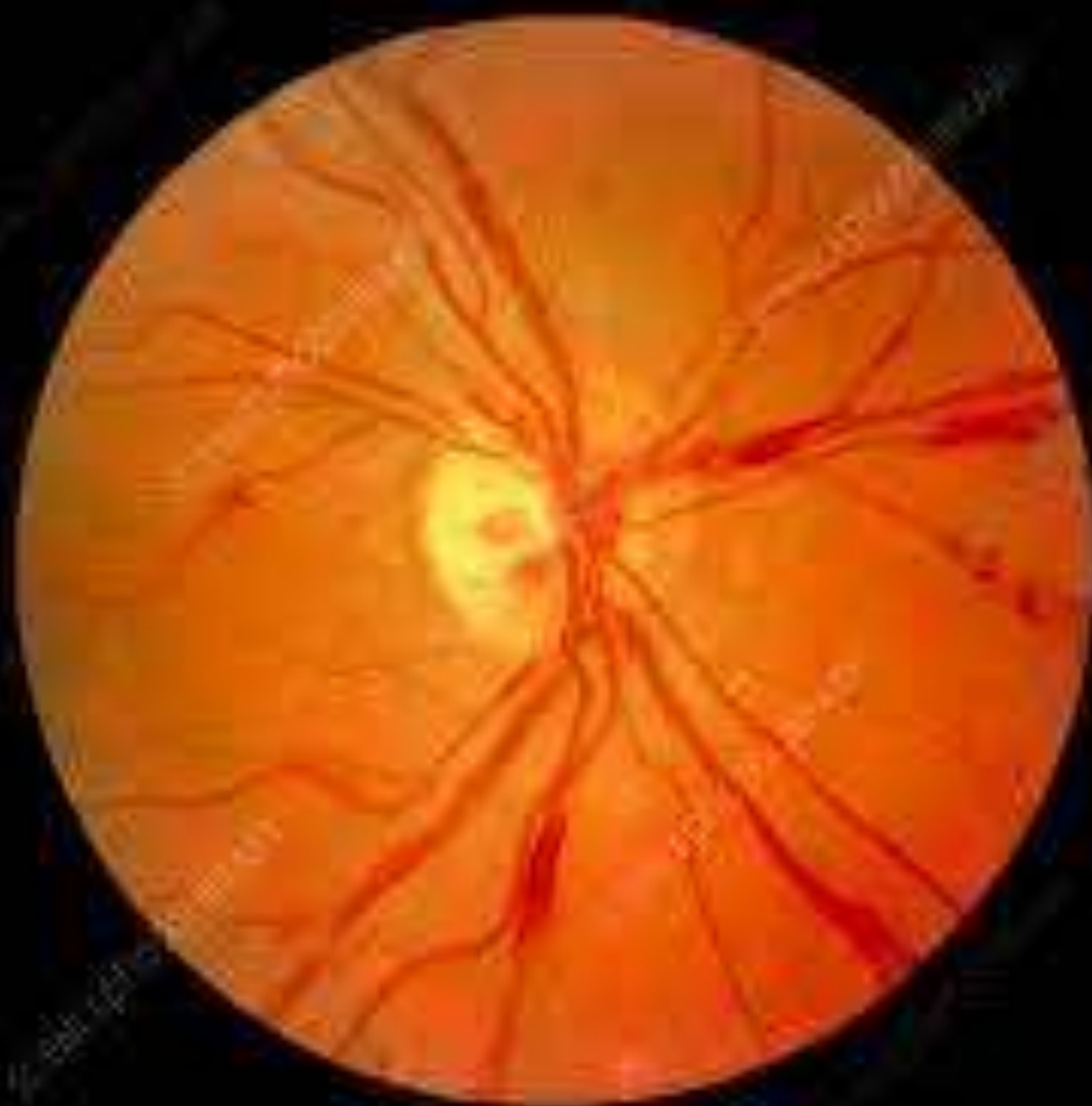


Ophthalmoscopy

Ophthalmoscopy



Ophthalmoscopy, also called funduscopy, is a test that allows a health professional to see inside the fundus of the eye and other structures using an ophthalmoscope (or funduscope). It is done as part of an eye examination and may be done as part of a routine physical examination. It is crucial in determining the health of the retina, optic disc, and vitreous humor.



Types

1- Direct ophthalmoscopy one that produces an upright, or unreversed, image of approximately 15 times magnification.

2- Indirect ophthalmoscopy one that produces an inverted, or reversed, image of 2 to 5 times magnification.

Types



Model shown:
BXA-4C



Features	Direct ophthalmoscopy	Indirect ophthalmoscopy
<i>Condensing lens</i>	Not Required	Required
<i>Examination distance</i>	As close to patient's eye as possible	At an arm's length
<i>Image</i>	<u>Virtual</u> , <u>erect</u>	<u>Real</u> , inverted
<i>Illumination</i>	Not as bright; not useful in hazy media	Bright; useful for hazy media
<i>Area of field in focus</i>	About 2-8 disc diameters	About 8 disc diameters
<i>Stereopsis</i>	Absent	Present
<i>Accessible fundus view</i>	Slightly beyond equator ^[<u>further explanation needed</u>]	Up to <u>Ora serrata</u> i.e. peripheral <u>retina</u>
<i>Examination through hazy media</i>	Difficult to not possible	Possible

Medical uses

Ophthalmoscopy is done as part of a routine physical or complete eye examination, mainly done by optometrists and ophthalmologists. It is used to detect and evaluate symptoms of various retinal vascular diseases or eye diseases such as glaucoma. In patients with headaches, the finding of swollen optic discs, or papilledema, on ophthalmoscopy is a key sign, as this indicates raised intracranial pressure (which could be due to hydrocephalus,

Medical uses

benign intracranial hypertension (aka pseudotumor cerebri) or brain tumor, amongst other conditions. Cupped optic discs are seen in glaucoma. In patients with diabetes mellitus, regular ophthalmoscopic eye examinations (once every 6 months to 1 year) are important to screen for diabetic retinopathy as visual loss due to diabetes can be prevented by retinal laser treatment if retinopathy is spotted early. In arterial hypertension, hypertensive changes of the retina closely mimic those in the brain and may predict cerebrovascular accidents (strokes).

Dilation of the pupil

To allow for better inspection through the pupil, which constricts because of light from the ophthalmoscope, it is often desirable to dilate the pupil by application of a mydriatic agent, for instance tropicamide, or simply reducing the brightness of the ophthalmoscope, which may slightly increase natural mydriasis, allowing a better view of the posterior eye. It is primarily considered ophthalmologist or optometrist equipment, but is used by other specialists as well, including neurology and internal medicine.



TONOMETER

Tonometr

Tonometry is the procedure eye care professionals perform to determine the intraocular pressure (IOP), the fluid pressure inside the eye. It is an important test in the evaluation of patients at risk from glaucoma. Most tonometers are calibrated to measure pressure in millimeters of mercury (mmHg).

Methods



Applanation tonometry

Goldmann tonometry

Dynamic contour tonometry

Electronic indentation tonometry

Non-contact tonometry

Perkins tonometer

Applanation tonometry

applanation tonometry the intraocular pressure (IOP) is inferred from the force required to flatten (applanate) a constant area of the cornea, for the Imbert-Fick law. the Goldmann tonometer is the most widely used version in current practice. Because the probe makes contact with the cornea, a topical anesthetic, such as proxymetacaine, is introduced on to the surface of the eye in the form of an eye drop

Goldmann tonometry

Goldmann tonometry is considered to be the gold standard IOP test and is the most widely accepted method. A special disinfected prism is mounted on the tonometer head and then placed against the cornea. The examiner then uses a cobalt blue filter to view two green semicircles. The force applied to the tonometer head is then adjusted using a dial connected to a variable tension spring until the inner edges of the green semicircles in the viewfinder meet.

Goldmann tonometry

When the area of a circle with diameter 3.06 mm (0.120 in) has been flattened, the opposing forces of corneal rigidity and the tear film are roughly approximate and cancel each other out allowing the pressure in the eye to be determined from the force applied. Like all non-invasive methods, it is inherently imprecise and may need to be adjusted







KERATOMETER




keratometer

refractive power of the eye depend on the cornea , which 
formed about $\frac{2}{3}$ of its power . Small changes in corneal
dramatic effect on image formation curvature.



This chapter examines how the refractive power of the cornea can be measured (keratometry) and how the anatomical structure of the eye can be quantified (pachymetry and specular microscopy) and looks at new techniques for assessing the optical properties of the eye as a whole (wave front).

KERATOMETER


Keratometry is used to assess corneal  shape, curvature and regularity, giving information about its refractive power. Just as small changes in corneal curvature cause a large change in corneal power, so small errors in measurement can affect the accuracy of calculations based on them, for example biometry.

KERATOMETER

is possible because the cornea acts as a convex mirror as well as a lens. The keratometer measures the reflection of an illuminated image of known size and position. This allows the radius of curvature of the mirror (or the anterior surface of the cornea) to be calculated. These measurements assume a refractive index of between 1.332 and 1.3375 for the cornea; different machines use different values. □

KERATOMETER



Most of these instruments are designed to  assess the central 3 or 4 mm of the cornea, as this is optically the most important part. However, in modern refractive surgery the asphericity of the peripheral cornea can have an important bearing on optical outcomes.

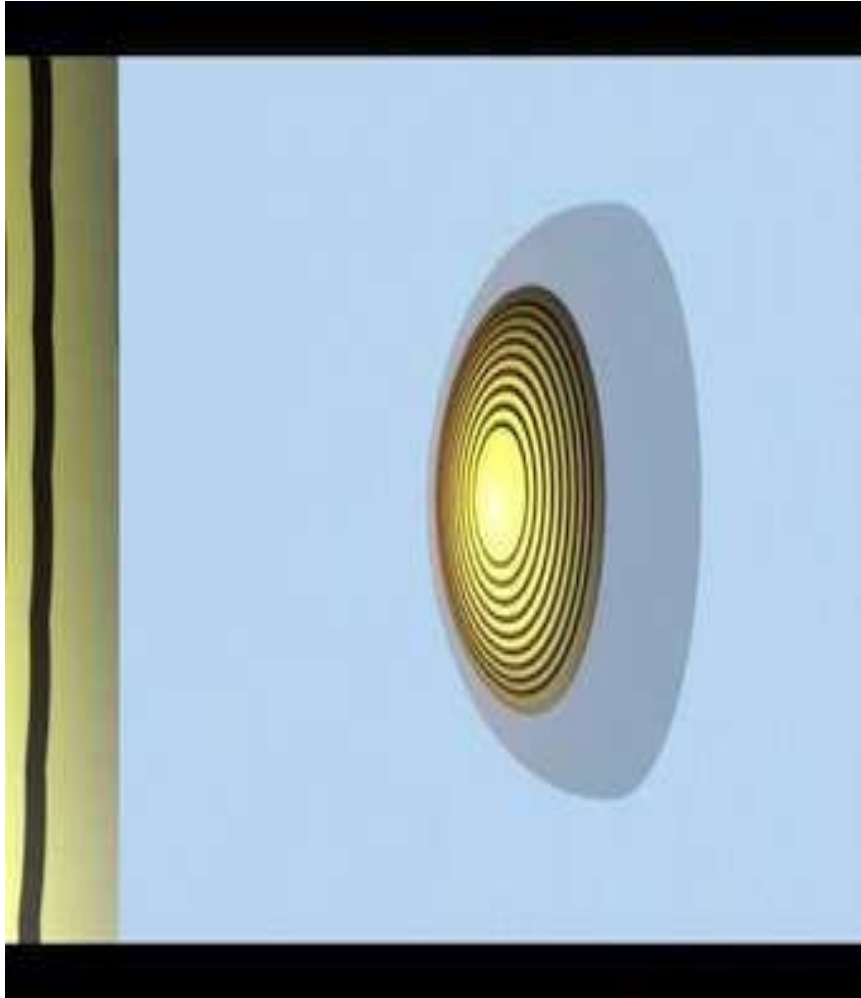
Normal rang

The average **K** was 43.57, with a range of 38.25 to 50. The average **Axial length** was 24.04, with a range of 18.4 to 31.91. More than 90% of K values were between 40.5 and 46.5; and more than 90% of the axial lengths were

between 22.5 and 26.5 mm

As axial length increases, the cornea tends to become flatter. (

Corneal topography



Uses

Corneal topography is most commonly used for the following purposes □

1- Refractive surgery: To screen candidates for normal corneal shape, patterns. .1

2-Keratoconus : Early screening of keratoconus suspects is one of the most useful roles of topography . Early keratoconus and suspects look normal on slit lamp examination ,and the central keratometry (3 mm) gives only a limited assessment. Therefore topography has become the gold standard in screening keratoconus suspects. In cases with established keratoconus, the role of topography is paramount for monitoring progression and doing a timely collagen cross linking , and in contact lens fitting. .2

keratoconus , monitoring of ocular vs corneal wavefront. .3

Uses

- 3- Post surgery astigmatism : Post cataract surgery and post keratoplasty corneal astigmatism can be studied with the topographer and selective suture removal or other interventions can be planned. .1
- 4-Surgical planning in cases with astigmatism : Limbal relaxing incisions and other methods of topography guided incision placement are used by surgeons to reduce post operative astigmatism. .2
- 5-Effect of corneal and ocular surface disorders: Disorders such as pterygium , limbal dermoid, localised corneal scars can cause a change in the corneal topography and thus the monitoring is very useful. .3
- 6-Other uses : Contact lens fitting , incision placement and intrastromal ring placement in .4

Practical steps

Step 1. ☐

Correctly identify the patient, age and eye. ☐

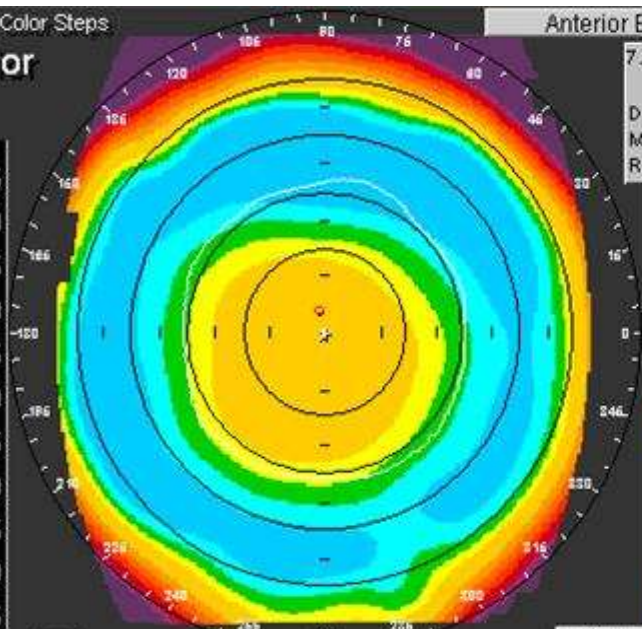
Step 2 .

Start by looking at the quad or multi map option as it gives the best visual comparison of the data. □

0.005 mm Color Steps

Anterior
Float

0.075
0.060
0.045
0.030
0.015
0.000
-0.015
-0.030
-0.045
-0.060
-0.075



Anterior Best Fit Sphere

7.66mm/44.0D

Diff:
Meridian:
Radius:

Posterior Best Fit Sphere

6.33mm/53.3D

Diff:
Meridian:
Radius:

Sim K's: Astig: 0.6 D @ 88 deg
Max: 46.3 D @ 88 deg
Min: 45.8 D @ 178 deg

3.0 MM Zone: Irreg: ± 0.8 D
Mean Pwr 45.9 ± 0.5 D
Astig Pwr 0.4 ± 0.6 D
Steep Axis 90 ± 40 deg
Flat Axis 172 ± 40 deg

5.0 MM Zone: Irreg: ± 1.8 D
Mean Pwr 45.2 ± 1.2 D
Astig Pwr 0.2 ± 1.4 D
Steep Axis 74 ± 43 deg
Flat Axis 162 ± 43 deg

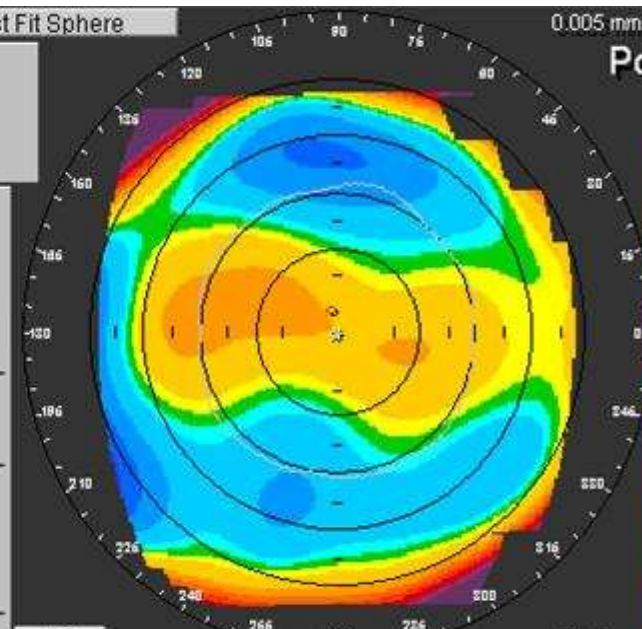
White-to-White [mm]: 11.8
Pupil Diameter [mm]: 5.2
Thinnest: 533 μ m @ (-0.1, 0.4)
ACD (Endo): 3.00 mm
Kappa: 3.76° @ 207.78°
Kappa Intercept: 0.02, 0.06

Max
Max

0.005 mm Color Steps

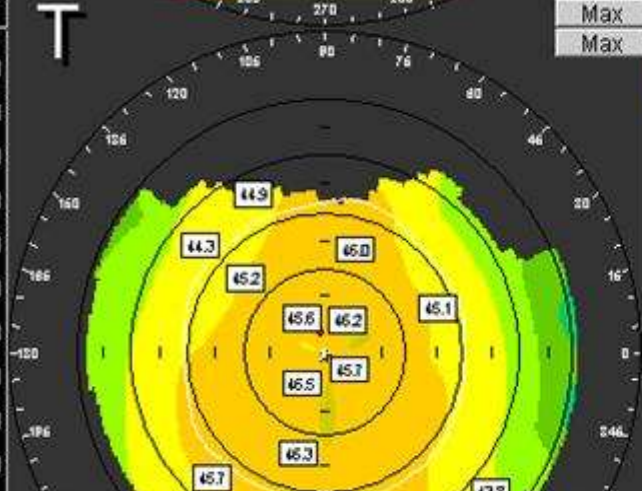
Posterior
Float

0.075
0.060
0.045
0.030
0.015
0.000
-0.015
-0.030
-0.045
-0.060
-0.075



Max
Max

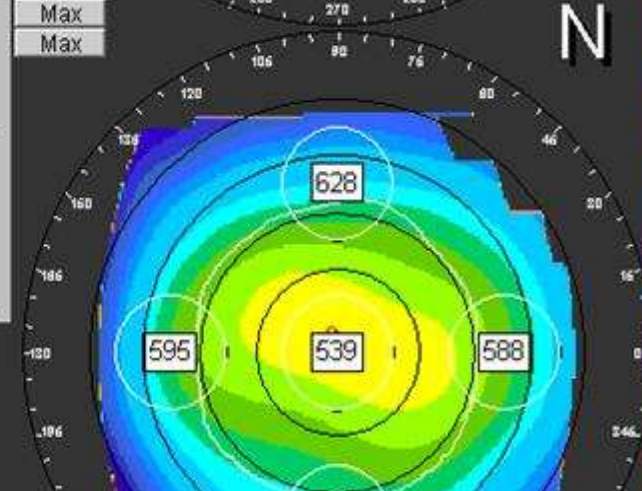
57.00
54.00
51.00
48.00
45.00
42.00
39.00
36.00
33.00
30.00



OD



N



900
840
780
720
660
600
540
480
420
360

Step 3.

Next step is to look at the pseudo color scale and identify the range and gradient of the values given. Each scan will have a color coding scale for the indices measured. For the absolute topographic map, these will be the absolute dioptric value at that point of the cornea. As we are trained to look at patterns for keratoconus or other corneal abnormalities, a tighter color coding scale may enhance patterns or more lax color coding scale will lead to missing out patterns. □

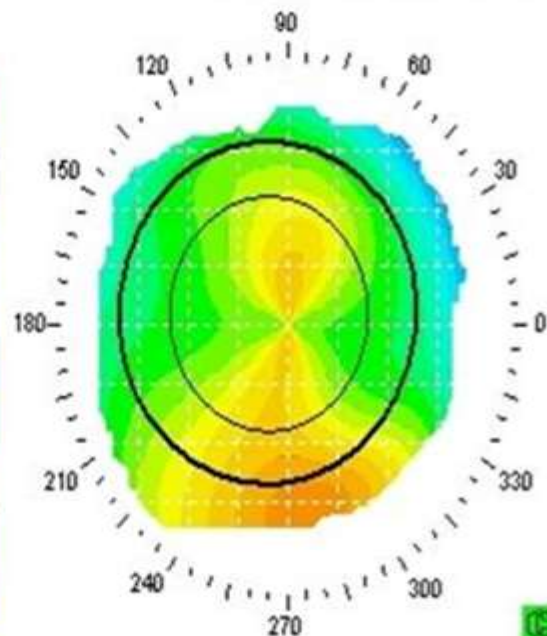
(a) Scan with 0.25 D steps between 35-41D

CT Axial Power

K1: 38.51D K2: 39.56D K2 Axis: 82°

Diopters

41.00
40.75
40.50
40.25
40.00
39.75
39.50
39.25
39.00
38.75
38.50
38.25
38.00
37.75
37.50
37.25
37.00
36.75
36.50
36.25
36.00



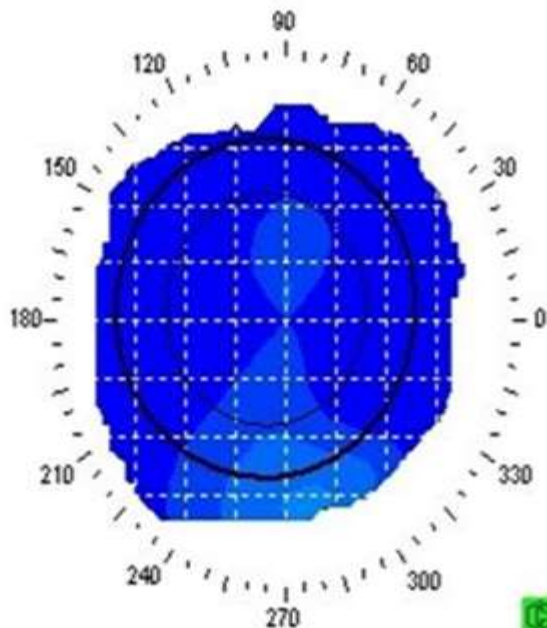
(b) Scan with 0.5 D steps between 33-49D

CT Axial Power

K1: 38.51D K2: 39.56D K2 Axis: 82°

Diopters

49.00
48.50
48.00
47.50
47.00
46.50
46.00
45.50
45.00
44.50
44.00
43.50
43.00
42.50
42.00
41.50
41.00
40.50
40.00
39.50
39.00

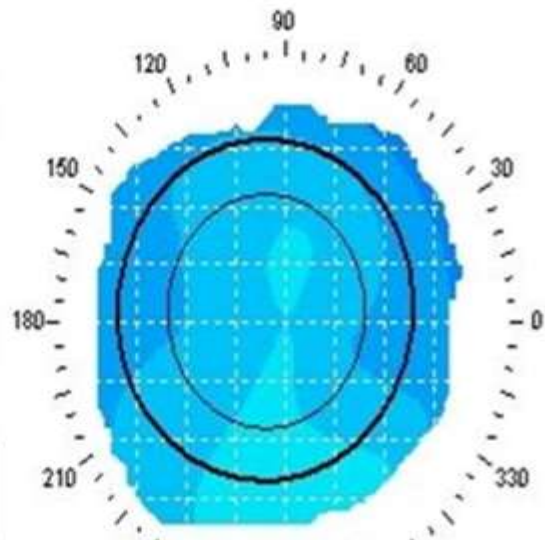


CT Axial Power

K1: 38.51D K2: 39.56D K2 Axis: 82°

Diopters

54.00
53.00
52.00
51.00
50.00
49.00
48.00
47.00
46.00
45.00
44.00
43.00
42.00
41.00
40.00
39.00
38.00
37.00

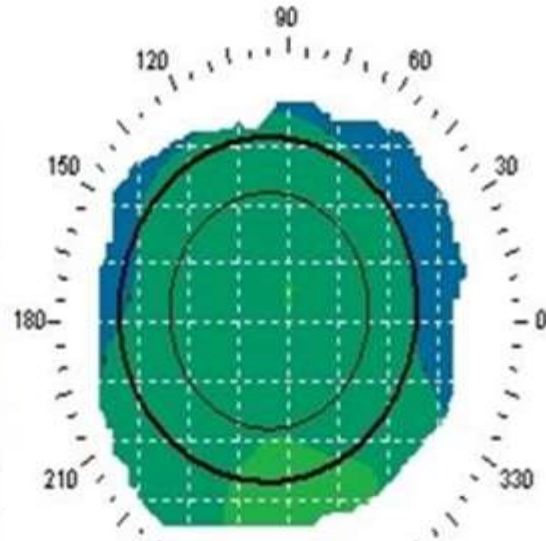


CT Axial Power

K1: 38.51D K2: 39.56D K2 Axis: 82°

Diopters

67.50
66.00
64.50
63.00
61.50
60.00
58.50
57.00
55.50
54.00
52.50
51.00
49.50
48.00
46.50
45.00
43.50
42.00
40.50
39.00
37.50
36.00

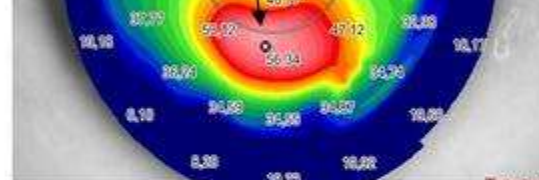


Step 5.

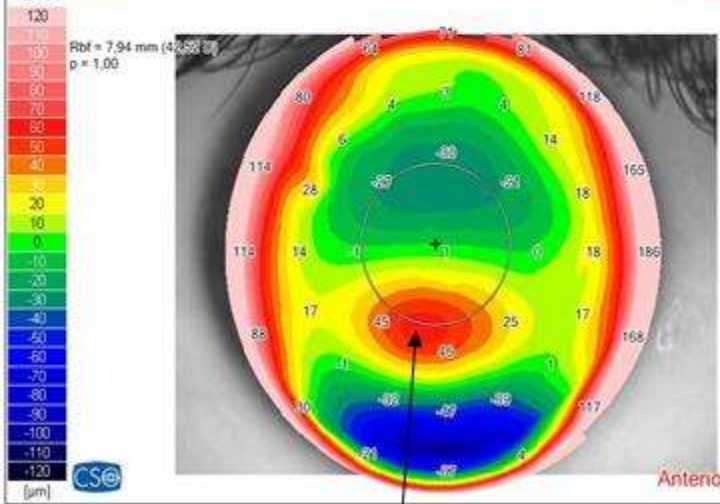
- The next step is to look at the actual numbers on the chart and in the statistics boxes .Numerical overlays show
- thinning and central corneal thickness .
- apical keratometry
- .
- anterior and posterior corneal elevations .
- specific details at a point .
- which can be assessed by moving the cursor on that point
- .The figure below shows the important numerical overlays



Corneal thickness

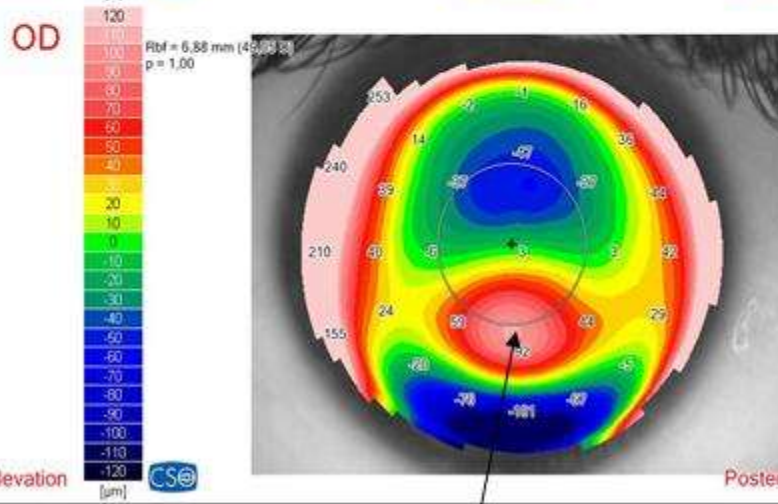


Tangential anterior



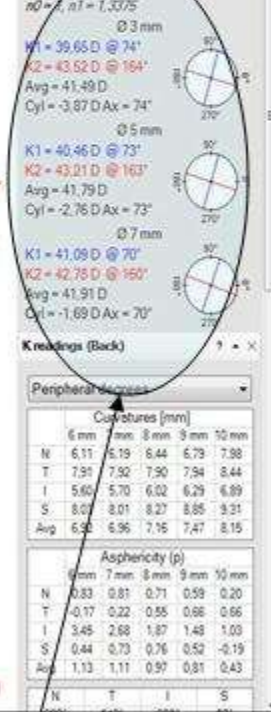
Anterior elevation

Anterior elevation max



Posterior elevation

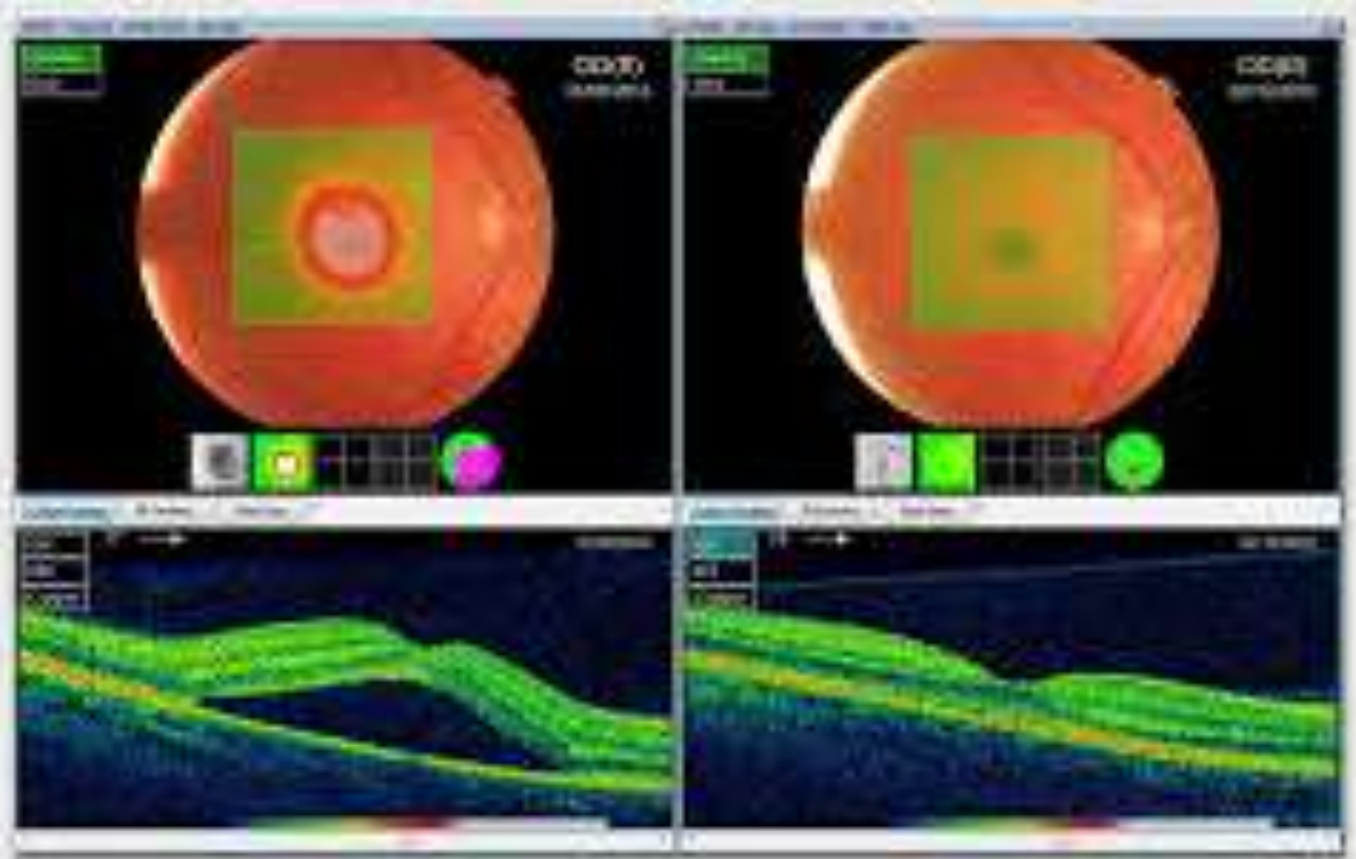
Posterior elevation max



Step 6

. □

Compare with slit lamp findings again. It should □ always be kept in mind that corneal topography can be effected by corneal artifacts and therefore interpretative value is decreased in cases such as corneal opacities, dry eye , corneal neo-vascularization and corneal scars.



Optical Coherence Tomography

Optical Coherence Tomography

Optical Coherence Tomography



Optical coherence tomography (OCT) was initially developed to obtain cross-sectional images of the retina noninvasively and anterior segment OCT (AS-OCT) became available for imaging the anterior ocular segment latterly

Optical Coherence Tomography



Is an imaging technique that uses low-coherence light to capture micrometer-resolution, two- and three-dimensional images from within optical scattering media.

Optical Coherence Tomography

Ocular OCT is used heavily to obtain high- resolution images of the retina and anterior segment. Owing to OCT's capability to show cross-sections of tissue layers with micrometer resolution, □

Optical Coherence Tomography

OCT provides a straightforward method of □ assessing cellular organization, photoreceptor integrity and axonal thickness in glaucoma , macular degeneration , diabetic macular edema , multiple sclerosis and other eye diseases or systemic pathologies which have ocular signs

OCT

