

# NCLE Basic Exam Review

## Domain III: Instrumentation for Measurement and Observation



Developed by the National Federation of  
Opticianry Schools

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**9:45 AM – 10:45 AM**

**On behalf of Vision Expo, we sincerely thank you for being with us this year.**

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**Mr. Steven B. Indelicato has no financial interests to disclose.**

**NCLE Basic Exam Review**  
**Domain III: Instrumentation for Measurement and Observation (16%)**  
**Mr. Steven B. Indelicato**

**I. Instrumentation:**

**A. Rigid Lens Verification:**

- a. Rigid Contact Lenses are verified before dispensing to the patient
- b. We make sure the parameters requested are what we receive
- c. CPC or Base Curve, Power, Diameter, Optic Zone, Center Thickness, Peripheral Curves and Tint

**B. Contact Lens Parameters:**

- a. CPC specified to .01 mm
- b. Diameter specified to the nearest .1 mm
- c. POZ specified to the nearest .1 mm
- d. PC's specified to the nearest .1 mm
- e. Thickness specified to the nearest .01mm
- f. Power specified to the nearest .12 D

**C. ANSI Standards:**

- a. Formed in 1918
- b. Private, non-profit based membership to establish voluntary quality standards for American made products
- c. Latest Version 2010

**D. Central Posterior Curve (CPC):**

- a. Also known as the base curve
- b. Primary curve on the concave surface (Fitting Curve)
- c. Contains the Optical Qualities of the Lens
- d. Radius of curvature measured
- e. **Radiuscope** is used to verify.
  - a. Measures to 0.01 mm
  - b. Concave surface (Back surface)
  - c. Convex Surface (Front Surface)
  - d. Measure Front Radius (PCC)
  - e. Measure Back Radius (ACC)
  - f. Warpage
  - g. Toric Lens Verification
  - h. Surface Scratches

**E. Measuring CPC:**

- a. Drop of saline is placed in lens holder, not alcohol because of evaporation
- b. Lens floats on saline concave side up
- c. Concave side dry

**F. Lensometry:**

- a. Concave surface is held against lens stop
- b. Careful not to bend lens
- c. Sphere and cylinder lines are read

**G. V-Gauge:**

- a. Measures diameter

**H. Shadowgraph:**

- a. Determines size of both diameter and optical zone.
- b. Used to examine surface of contact lens and edge of contact lens.

**I. Hand held magnifier:**

- a. Used to determine diameter of lens and optical zone
- b. Used to examine front surface of contact lens
- c. Check Edge Contour

**J. Optical zone:**

- a. Specified to nearest 0.1 mm
- b. Seeing area of the lens
- c. Chord length of CPC
- d. Measured with hand held magnifier or shadowgraph

**K. Peripheral Curves:**

- a. Curves flatten towards the periphery as the cornea flattens.
- b. Specified to nearest 0.1 mm
- c. Important to check the blend between the curves.

**L. Diameter, POZ and Peripheral Curve Calculations:**

- a.  $\text{Diameter} = \text{POZ} \times 2 (\text{PPC}/w + \text{PIC}/w)$
- b. E.g. A lens has a 9.5 Diameter,  $\text{PPC}/w = .3 \text{ mm}$  and the  $\text{PIC}/w = .2 \text{ mm}$ .  
What is the size of the POZ?
- c.  $9.5 = 2 (.3 + .2)$
- d.  $9.5 = 1.0 \text{ mm}$

- e.  $9.5 - 1.0 = 8.5$  POZ

**M. Profile Analyzer:**

- a. Checks blends

**N. Contact Lens Tints:**

- a. Colors – Blue, Gray, Green, Brown, Rose
- b. RGP's – usually Blue, Gray or Green
- c. Density:
- d. #1 – 10%
- e. #2 – 20%
- f. #3 – 30% +

**O. Keratometer:**

- a. Measures curvature of cornea
- b. "K" readings
- c. Principal meridians and axis
- d. Amount of corneal astigmatism
- e. Oldest and most widely used instrument to measure the curvature of the eye
- f. May be referred to as the ophthalmometer
- g. Mires
- h. Capabilities
- i. Procedure
- j. Recordings Examples: O.D. 43.00 @ 180 / 43.50 @ 90
- k. O.D. 43.00 x 180 / 43.50 x 90
- l. Measured in diopters
- m. Average reading between 42.00D & 45.00D
- n. Only measuring the center corneal cap 2.5mm – 4.00mm
- o. Range of keratometer is 36.00D to 52.00D
- p. Record horizontal reading first
- q. Record axis for horizontal
- r. Record vertical reading
- s. Record axis for vertical
- t. Higher number in diopters signifies a steeper curve
- u. Lower number in diopters signifies a flatter curve

**P. Astigmatism:**

- a. Regular
- b. Irregular
- c. Symmetrical (ex: "K" 43.00 @ 180 / 44.00 @ 90)
- d. Asymmetrical (ex: "K" 43.00 @ 180 / 44.00 @ 70)

- e. With The Rule (WTR)- Flattest Meridian at 180 (ex:“K” 43.00 @ 180 / 44.00 @ 90) – Most corneas are WTR
- f. Against The Rule (ATR)- Flattest Meridian at 90 (ex:“K” 44.00 @ 180 / 43.00 @ 90) -- This astigmatism is usually associated with Lenticular or Internal astigmatism
- g. Oblique--“K” 43.00 @ 135 / 44.00 @ 45
- h. Extending the Keratometer Range: +1.25 – 9.00 Diopters = 52.00 – 61.00
- i. -1.00 – 6.00 Diopters = 36.00 – 30.00

**Q. Slit Lamp (Biomicroscope):**

- a. For viewing eye under magnification
- b. Eye structures (mostly anterior segment)
- c. Refractive principles utilized w/ addition of light and filters
- d. Procedures
- e. Illuminations
- f. Diffuse

**R. Direct:**

- a. microscope trained directly into the slit – Parallelpiped, Optic section, Specular reflection
  - a. **Diffuse:** Overall view of anterior segment. Lens position and movement of contact lenses. Surface quality of lens.
  - b. **Parallelpiped:** 1-2mm slit, medium to high magnification, Cross-sectional view of cornea, Corneal clarity, Lens deposits
  - c. **Optic Section:** Slit width < 1mm, Medium to high magnification, Cross-sectional view of corneal layers, Depth of corneal irregularities, Surface topography of bumps and indentations
  - d. **Specular Reflection:** 1-2mm slit, Medium to high mag., Fine lens deposits, Subtle corneal imperfections, corneal endothelium

**S. Indirect:** microscope trained adjacent to the slit – Indirect, Retroillumination, Sclerotic Scatter:

- a. **Indirect:**
  - a. 1-2mm slit, Medium to high magnification, View area adjacent to the slit
  - b. Opaque structures – lids, sclera, conjunctiva. Vascularization, pingueculae, pigmentation
- b. **Retroillumination:**
  - a. 1-2mm slit,
  - b. medium to high magnification, light is reflected off an opaque structure behind the area being viewed, corneal neo-vascularization
- c. **Sclerotic Scatter:**
  - a. 2-4mm slit, aimed at limbus from a wide angle, Look for circumcorneal halo, View straight ahead w/ no magnification

- b. Classic use is to view patch edema
- c. Corneal Scars
- d. Incisions
- e. SCL edge lift

**T. Instrumentation:**

- a. **Phoropter**- Refraction device combining a large variety of spherical and cylindrical lenses, prisms, occluders and pinholes; used in determining an eye's optical correction
- b. **Trial Set**- A large variety of spherical and cylindrical lenses, prisms, occluders and pinholes; used in determining an eye's optical correction
- c. **Retinoscope**- Hand-held device for measuring the eye's refractive error, with no verbal response required from the patient. Light movement is neutralized by lenses from either the phoropter or trial lenses
- d. **Ophthalmoscope**- Device used for examining the interior of the eye, especially the fundus and retina
- e. **Autorefractor**- Electro-mechanical or computerized device used for determining an eye's refractive error