

OPT-2702: REFRACTOMETRY

Cuyahoga Community College

Viewing: OPT-2702 : Refractometry

Board of Trustees:

January 2022

Academic Term:

Fall 2022

Subject Code

OPT - Optical Technology

Course Number:

2702

Title:

Refractometry

Catalog Description:

Entry level knowledge of theory and performance of refraction as it relates to human eye. Study of ocular structures, ametropia neutralization, astigmatism, objective and subjective refraction, anomalies of vision, and clinical refraction.

Credit Hour(s):

2

Lecture Hour(s):

1

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

OPT-1710 Introduction to Patient Care, or departmental approval.

Outcomes

Course Outcome(s):

Discuss ocular anatomy and physiology as it pertains to refractometry.

Objective(s):

1. Identify structure, function and pathology of the human eye.
2. Assess and evaluate the refractive error of a human eye using the phoropter.

Course Outcome(s):

Perform all skills associated with refractometry.

Objective(s):

1. Identify all parts of the phoropter.
2. Operate and maintain ophthalmic equipment.
3. Assess and evaluate the refractive error of a human eye using the phoropter.

Course Outcome(s):

Compare and contrast the differences between objective and subjective refraction.

Objective(s):

1. Describe the process of retinoscopy (objective refraction).
 2. Discuss why modern refractometry is based upon subjective, rather than objective refraction.
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Methods of Evaluation:

1. Weekly quizzes
2. Midterm
3. Final exam
4. Practical Skills Assessment

Course Content Outline:

1. Review of Ocular Anatomy and Physiology
 - a. The Globe
 - i. Conjunctiva
 - ii. Cornea
 1. Tear layer
 2. Epithelium
 3. Bowman's layer
 4. Stroma
 5. Descemet's membrane
 6. Endothelium
 - iii. Iris
 - iv. Pupil
 - v. Anterior Segment
 1. Anterior Chamber
 2. Posterior Chamber
 - vi. Crystalline lens
 - vii. Posterior Segment
 - viii. Ciliary Body
 1. Ciliary muscle
 2. Zonules of Zinn
 - ix. Fundus
 1. Retina
 - a. Retinal regions
 - i. Peripheral retina
 - ii. Macula lutea
 - iii. Fovea centralis
 - b. Retinal layers
 2. Choroid
 3. Optic Nerve
 - a. Optic disc
 - b. Optic cup
 - x. Sclera
 - b. Ocular pathology
 - i. Ametropia
 - ii. Presbyopia
 - iii. Nystagmus
2. Review of Optics
 - a. Physical Optics
 - b. Geometric Optics
 - i. Focal Length
 - ii. Lenses
 1. Prisms
 2. Spherical lenses
 3. Cylinder
 - a. Cardinal points
 - b. Transposition
 - c. Spherical Equivalent

- d. Induced Prism
- e. Optical Cross
- f. Reflection
- c. Physiologic Optics
 - i. Schematic Eye
 - 1. Calibration
 - a. Align pupillary axis
 - b. Check optical alignment
 - c. Place working lens
 - d. Set eye to plano
 - e. Check working distance
 - f. Check fundus reflex
 - g. Make appropriate adjustments
 - h. Verify measurement by checking scale
 - i. Recalibration of instrument
 - j. Confirm calibration
 - k. Check for astigmatism
 - ii. Refractive Errors
 - 1. Myopia
 - 2. Hyperopia
 - 3. Astigmatism
 - a. Simple myopic astigmatism
 - b. Compound myopic astigmatism
 - c. Simple hyperopic astigmatism
 - d. Compound hyperopic astigmatism
 - e. Mixed astigmatism
 - iii. Correction of refractive errors
 - 1. Sphere lenses
 - 2. Cylinder lenses
 - 3. Compound lenses
 - iv. Retinal Image Size
 - d. Optics of Refractive Surgery
 - i. The cornea and refractive surgery
 - ii. Surgical correction of refractive errors
 - iii. Wavefront Analysis
 - 1. Aberrations
 - 2. Variabilities in Wavefront Technology
 - iv. Intraocular refractive surgery
- 3. Retinoscopy theory
 - a. History of retinoscopy
 - b. The retinoscope
 - i. Projection system
 - ii. Observation system
 - iii. Clinical retinoscopy
 - c. Proper maintenance procedures
 - d. Basic Principles
 - i. Reflex and intercept
 - ii. Working distance
 - iii. Reflex Movement
 - 1. With motion
 - 2. Against motion
 - 3. Scissors movement
 - iv. Neutrality
 - v. Visual Axis
- e. Procedure
 - i. Neutralizing spherical ametropia
 - ii. Neutralizing astigmatism

- 1. Plus cylinder
 - 2. Minus cylinder
 - iii. Verifying neutrality
 - f. Radical retinoscopy
 - g. Dynamic retinoscopy
 - h. Refining cylinder and axis power
 - i. Estimation techniques
 - i. Estimating without lenses
 - ii. Reliability and accuracy
 - j. Proper maintenance procedures
4. Refractometry
- a. Phoropter
 - i. Level
 - ii. Leveling screw
 - iii. Aperture convergence lever
 - iv. Aperture knob
 - v. Sphere dial
 - vi. Sphere power
 - vii. Aperture
 - viii. PD adjusting knob
 - ix. 3.00 diopter sphere dial
 - x. Cross cylinder
 - xi. Cylinder axis dial
 - xii. Cylinder dial
 - xiii. Cylinder power
 - b. Proper maintenance procedures
 - c. Preparing the patient
 - d. Aligning the phoropter
 - e. Estimating the starting point
 - f. An initial determination of sphere power
 - g. Cylinder refinement
 - i. Plus Cylinder Technique
 - 1. Astigmatic dial (plus cylinder)
 - 2. Cross cylinder technique (plus cylinder)
 - ii. Minus cylinder technique
 - 1. Astigmatic dial (minus cylinder)
 - 2. Cross cylinder technique (minus cylinder)
 - iii. Locating proper axis
 - iv. Final refinement of cylinder power
 - v. Final refinement of sphere power
 - h. Pinhole disk
 - i. Binocular balance
 - i. Prism dissociation tests
 - ii. Duochrome test
 - j. Cycloplegic refractometry
 - k. Alternate procedures for refining astigmatism correction
 - i. Rotating the cylinder axis
 - ii. Four-diamond charts
 - l. Determining Near Addition power
 - i. Amplitude of accommodation
 - 1. Push-up method
 - 2. Minus sphere method
 - ii. Dynamic cross cylinder test
 - iii. Adjusting sphere power for best near vision
 - m. Vertex Distance
 - n. Latent Nystagmus
5. Special Considerations

- a. Children
 - b. Patients with special needs
 - c. Patients who have had refractive surgery
 - d. Aphakic patients
 - e. Pseudophakic patients
6. Documentation
 - a. Proper documentation in the patient record
 - b. Transcribing duplicate prescriptions
 7. Scope of practice

Resources

Benjamin, William J., and Irvin M. Borish, eds. *Borish's Clinical Refraction*. 2nd Edition. W. B. Saunders, 2006.

Kolker, Richard. *Subjective Refraction and Prescribing Glasses: The Number One (or Number Two) Guide to Practical Techniques and Principles*. 3rd. Slack Incorporated, 2018.

Lens, Al. *Optics, Retinoscopy, and Refractometry*. 2nd Edition. Slack Incorporated, 2006.

Stein, Harold A. et al. *The Ophthalmic Assistant*. 10th Edition. Elsevier Mosby, 2017.

Resources Other

<https://store.jcahpo.org/searchresults.aspx?categoryid=66>

<https://timroot.com/videos/>

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