



# COT Certification Written Exam Review, Part 1 March 16, 2019

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Certified Ophthalmic Technician Certification (COT)

To qualify for certification at the COT level, you must meet one of the following four options:

Eligibility Pathway	Required Experiences	Required Work Experience
COT - T1	<ul style="list-style-type: none"> <li>Completion of a COMT accredited training program at the Technician level</li> <li>If you completed the program more than 12 months ago, you will need to submit 12 JCAMP Group A credits for each year following graduation. The credits must be earned within 36 months prior to submitting your application.</li> </ul>	None necessary
COT - T2	<ul style="list-style-type: none"> <li>Current COMT certification &amp; JCAMP Group A credits</li> <li>You will need to submit 12 JCAMP Group A credits earned within 12 months prior to submitting your application.</li> <li>Must maintain certification as a COMT while pursuing COT certification</li> </ul>	Employed 2,000 hours as a COMT within 24 months prior to submitting application
COT - T3	<ul style="list-style-type: none"> <li>Current COMT or OOC certification &amp; JCAMP Group A credits</li> <li>You will need to submit 12 JCAMP Group A credits earned within 12 months prior to submitting your application.</li> <li>Must maintain certification as an Ophthalmic Technician while pursuing COT certification</li> </ul>	Employed 2,000 hours as an OOC within 24 months prior to submitting application
COT - T4	<ul style="list-style-type: none"> <li>Fast Track option: Allow a current COMT the use of 6,000 hours of non-certified work experience prior to becoming certified, and JCAMP Group A credits.</li> <li>You will need to submit 12 JCAMP Group A credits earned within 12 months prior to submitting your application.</li> <li>Must maintain certification as a COMT while pursuing COT certification</li> </ul>	<ul style="list-style-type: none"> <li>Current COMT certification</li> <li>6,000 hours of non-certified work experience with an ophthalmologist prior to becoming a COMT certified</li> <li>Verification of previous work experience needs to be in the form of a letter from your ophthalmologist on official letterhead</li> </ul>

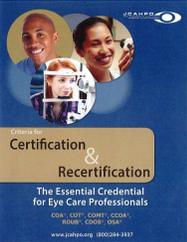
\* Individuals who graduate from a non-accredited training program at the Technician level are eligible to apply for their certification under the T4 pathway.  
 † COMT is the Commission on Accreditation of Ophthalmic Technician Programs. COMT is a member of the Association of Ophthalmic Technicians.  
 ‡ Candidates who submit a formal training program may apply for an certification exemption up to two months prior to graduation from the program. Exemption is available only for candidates who have completed the program and are currently employed in the field of ophthalmic technician work.

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COA, COT, and COMT Content Area Percentages

CONTENT AREA	COA %	COT %	COMT %
History Taking	8	6	3
Pupillary Assessment	3	5	4
Contact Lenses	2	3	0
Equipment Maintenance and Repair	4	4	3
Lensometry	3	5	6
Keratometry	3	5	3
Medical Ethics, Legal, and Regulatory Issues	5	3	5
Microbiology	2	3	5
Pharmacology	8	5	8
Ocular Motility	3	5	11
Assisting in Surgical Procedures	7	6	3
Dynamic Patient Services and Education	16	7	10
Ophthalmic Imaging	3	7	6
Refraction	6	7	6
Spectacle Skills	3	3	0
Supplemental Skills	8	9	10
Tonometry	4	5	5
Visual Assessment	8	6	6
Visual Fields	4	6	6

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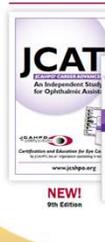


## Criteria for Certification & Recertification, JCAHO

**Certification & Recertification**  
The Essential Credential for Eye Care Professionals

COMT - COMT - COMT - COMT - COMT - COMT  
www.jcaho.org 800.228.3937

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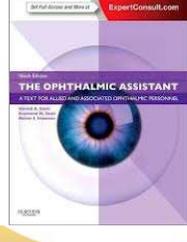


## JCAT PKG

175 Test Item Quiz, a study plan and *The Ophthalmic Assistant*, 9th Edition by Stein, Stein, & Freeman

**NEW!**  
9th Edition

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## Book only: *The Ophthalmic Assistant*, 9th Edition

by Stein, Stein & Freeman

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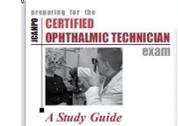


## ATPO Flash Cards

COT Certification Exam Review

ATPO Members  
Non-Members

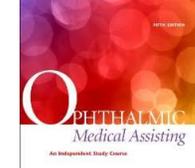
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## Preparing for the COT Exam: A Study Guide

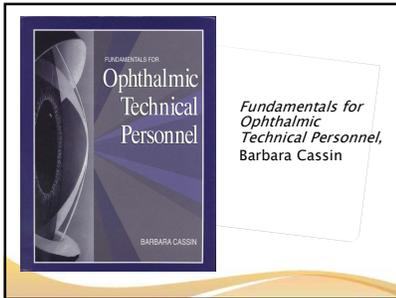
Includes: descriptions of the exam, screen captures, sample exam questions, and study tips.

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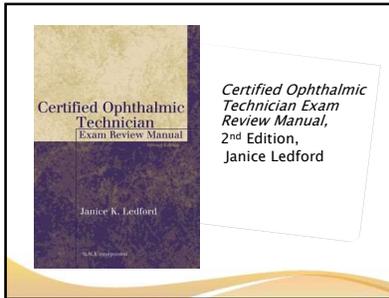
## Ophthalmic Medical Assisting: An Independent Study Course, 5th Edition, AAO

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*Fundamentals for Ophthalmic Technical Personnel,*  
Barbara Cassin

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*Certified Ophthalmic Technician Exam Review Manual,*  
2<sup>nd</sup> Edition,  
Janice Ledford

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## Let's Get Started!

**COMPUTER-BASED EXAM**

- ▀ 200 Questions Scored.
- ▀ There are 10-25 questions which are not scored. You will not be able to identify these questions.
- ▀ Three hours to complete the exam.
- ▀ Four distracters for each question.
- ▀ Each question has **"ONE BEST"** response.
- ▀ While taking the exam, you can:
  - Answer the question.
  - Mark the question for review at the end of the exam.

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## History Taking

(6% of Exam)

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### History Taking

- All patient's history recorded with accuracy, in the **patient's own words**, if possible
- This history is part of the entire record which provides valuable information
- Additions and corrections must be made properly.

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### Components of a History

- Chief Complaint
- History of Present Illness (HPI)
- Past Ocular History
- Medical and Surgical History
- Medications
- Allergies
- Social History
- Family History

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### Personal History

- Name (nickname) and Title
- Address
- Telephone numbers
- Social Security number
- Date of birth (age)
- Employer/Occupation
- Spouse or parent (guardian)
- Power of attorney

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### Chief Complaint

- **Chief complaint** asks the question what is the reason for your visit? **"Why is the patient here today?"**
- This is the subjective problem in the patient's own words
- Identify the problem with accuracy and efficiency
- Listen first, then document it

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### Required Elements of an HPI

- Location (OD vs. OS)
- Quality (Sharp or dull pain)
- Severity (mild, moderate or severe)
- Duration (How long does it last?)
- Timing (When did it start?)
- Context (Were you doing anything when it happened?)
- Modifying factors (Has the patient tried any treatments?, Does anything make it better or worse?)
- Associated signs and symptoms (flashes/floaters)

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## HPI TEST

How many HPI elements can you count in the following Hx:

"Cataracts OU; c/o glare; especially with PM driving; c/o very blurred vision x 6 months."

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## Ocular History

- › Surgeries and laser procedures
- › Diagnosis of all eye diseases or conditions
- › Eye injuries
- › Contact lens and/or spectacle wear history
  - Age at first eye glass prescription?
  - Were eyes equal then?
- › Eye therapies, patching, prisms, etc.
  - Past IOL information is important
    - All should include date of surgery, which eye, surgeon's name, and specific IOL info

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## Medical History

- › Complete ROS, (review of systems) past and present
  - The ROS should include 14 body systems and must be signed and dated by the examining physician
- › Illnesses
  - Includes any therapies, such as chemotherapy, radiation, etc.
  - DM, HTN, heart/kidney disease, headaches
- › Surgeries
- › Injuries
  - Is it really a negative finding, or an omission?

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## Review of Systems

- › Allergic/Immunologic
- › Cardiovascular/Cardiac
- › Constitutional Symptoms
- › Ears, Nose, Mouth, and Throat
- › Endocrine
- › Eyes
- › Gastrointestinal
- › Genitourinary
- › Hematologic
- › Integumentary
- › Musculoskeletal
- › Neurological
- › Psychiatric
- › Respiratory

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## Systemic Medications

- › Prescribed medicines
  - Name, dosage, (strength if applicable), purpose
- › OTC medications,
  - Vitamins
  - Herbs and supplement
- › Watch spelling
- › Match medication listed to a medical condition

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## Ophthalmic Medications

- › All prescribed drops and ointments
- › All the OTC drops and ointments
- › "Lid scrubs" or similar therapies
  - Dosage, strength, and specifics all should be included
  - Documentation of last dosage, if indicated, i.e. History of glaucoma
  - Compliance may also be noted

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## Allergies

- › Drug
- › Systemic
- › Ophthalmic
- › Environmental
- › Allergy vs. Adverse Reaction
  - Allergy- can be dangerous (i.e. itching, constricting airway)
  - Adverse reaction- uncomfortable (i.e. nausea, dizzy, bad taste in mouth, etc.)

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## Social History

- › Usage of
  - Tobacco
  - Alcohol
  - Drugs
- › Sexual History (STDs)
- › Occupation

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## Family History

- › Does anyone else in the family have a condition like yours?
- › Pertinent family history: *Diabetes, hypertension, cancer, retinal disease, glaucoma, cataracts*
- › May uncover vital information
- › More specific questions may be required
- › Absence of data should not be construed as negative family history, negatives must be documented

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# Pupillary Assessment

(5% of Exam)

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## Two Pupillary Muscle Groups

- › **Dilator Muscle:** Dilates; Innervated by **sympathetic** branch of autonomic nervous system
- › **Sphincter Muscle:** Constricts; Innervated by the **parasympathetic** branch of ANS

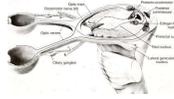


science20.com

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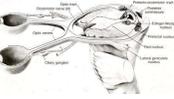
## Afferent vs. Efferent Anatomy

**Afferent Anatomy**



Retina Optic Nerve Chiasm  
Midbrain (3rd nerve nucleus)

**Efferent Anatomy**



3rd nerve Ciliary Ganglion Iris  
Sphincter & Ciliary Body

See Afferent-Efferent sheet

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## Evaluation of Pupils

- › Size (in mm)
  - In each eye in Dim and Bright light and
  - Note comparison between size of two eyes
    - Equal vs. **Anisocoria**
- › Shape- round, irregular

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## Evaluation of Pupils

- › Light reaction
  - Direct response in each eye and
  - Direct response relative to each other
  - Direct response Swinging Flashlight Test
  - RAPD
- › **Consensual response**
  - Hippus
  - Fixed
- › Accommodative reaction
- › Recording pupil evaluation results
  - Normal: PERL (or PERRLA) and no APD



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## Pupillary Reactions

- › Lighting conditions
- › Accommodation
- › Medication
- › Hormones

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## Evaluation of Pupils



**Anisocoria**

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## Pupil Problems

- › Marcus Gunn/ APD
- › **Horner's Syndrome - Ptosis/Miosis/Anhidrosis**
- › Third Nerve Palsy
- › Argyll Robertson
- › Adies Pupil
- › Iritis
- › Anisocoria
- › Pharmacologic

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## Contact Lenses

(3% of Exam)

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## Basic Principles

- › Hard lenses
- › Soft lenses
- › Toric lenses
- › Astigmatism
- › Bifocal
- › Aphakic
- › Extended wear
- › Gas permeable
- › **Truncated**
- › Bandage lenses
- › Oxygen permeability
- › Lens characteristics
- › Rigid lenses

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## Contact Lenses

- › Do you understand the difference between spherical and toric CL's?
  - Know when to use and when to avoid.
  - Front, back, & bi-toric
  - Lens markings...
  - Rotation compensation: LARS (left add, right subtract)
- › Bifocal/multi-focal CL's
- › Aphakic CL's
- › Piggyback lenses
- › Treating keratoconus patients with CL's
- › Truncated

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## Measure

- › Base Curve
- › Power
- › Diameter
- › **Dk Value**



<https://www.mylcon.com/products/contact-lenses/>

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## Base Curve

- › Curvature of the back of a contact lens
- › Typical base curves of soft contacts 8.4, 8.6, 8.8
- › Base curve is crucial for a good fit.
  - Too tight
  - Too loose

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## Power

- › Amount of refractive correction in the lens
- › Measured in diopters
- › May be spherical or contain astigmatic correction
- › May also contain presbyopic correction

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## Diameter

- › Measured in millimeters (mm)
- › Soft CLs larger than corneal diameter
- › RGPs much smaller diameter

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## Dk Value

- › Dk refers to the oxygen permeability of the lens
- › The higher the Dk value, the greater the amount of oxygen that passes through the material of the lens.

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## Patient Counsel

- › Dry Eyes
- › Keratoconus
- › Astigmatic Correction
- › Presbyopic Correction
- › Soft Lenses vs. Gas Permeable

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## Fitting

- › Fitting CL's What are the advantages & disadvantages of "hard" vs. soft CL's?
- › Hard (**PMMA**) vs. RGP (silicone acrylic, silicone vs. fluoropolymers)
- › Soft lenses
  - Most are HEMA material
  - Now fluoropolymers
  - Spincast vs. cast molded vs. lathe-cut
- › Know general differences in materials

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## Fitting Contact Lenses

- › Goals:
  - Centration
  - Stable vision
  - Good movement
- › Lens considerations:
  - Keratometry/ base curve
  - Corneal diameter/ lens diameter
  - Pupil diameter
  - Dry eyes?
  - Lid tightness (may need bigger lens if lid laxity)

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## Fitting Procedures

- › Keratometry
- › Corneal diameter
- › Pupil diameter
- › Tear secretion
- › Eyelid tightness and fissure size
- › Fluorescein pattern
- › Spectacle prescription conversion
- › Over-refraction
- › Pediatric
- › Contraindications

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## Fitting Contact Lenses

- › Keratometry:
  - Used to determine Base Curve
  - Considered normal when between 42.00-45.00D
  - Considered flat when less than 42.00D
  - Considered steep when greater than 45.00D
- › Note mire quality:
  - Clear vs. 1+ to 4+ distorted
- › Corneal warpage from CL's
- › Topography

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## Refraction

- › Needed to determine the power of the contact lens.
- › The amount of astigmatism in the refraction determines if a spherical or an astigmatic (Toric) lens will be used.
- › Typically, more than a diopter of astigmatism indicates the need for a Toric lens.
- › If less than one diopter of astigmatism, then the spherical equivalent of the refraction [in minus (-) cylinder] is used to determine the power of the contact.

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## Spherical Equivalent

- › Equivalent of a glasses prescription expressed only as a sphere
- › Used to calculate spherical contact lenses
- › Used to reduce the amount of cylinder in a glasses prescription

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## Spherical Equivalent

- › Step 1) Take half of the cylinder.
- › Step 2) Add this to the sphere algebraically.
- › Step 3) Drop the original cylinder & axis.
- › Ex:  $-4.00 -2.00 \times 90$ 
  - Half of  $-2.00 = -1.00$
  - $(-1.00) + (-4.00) = -5.00$  sph
- › Answer =  $-5.00$  sph

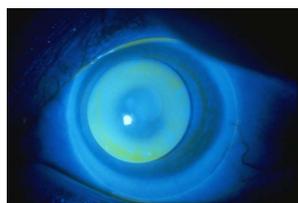
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## What is the spherical equivalent of:

- ›  $+2.00 -1.00 \times 75$ 
  - Half of  $-1.00 = -0.50$
  - $-0.50 + (+)2.00 = +1.50$
- › Answer =  $+1.50$  sph

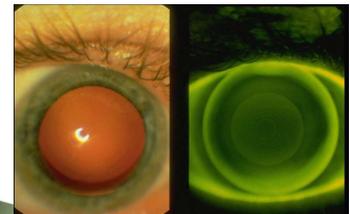
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## Piggy-Back Contact Lenses



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## Diffraction Bifocal RGP



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## Patient Instruction

- › Insertion
- › Removal
- › Cleaning
- › Storage
- › Hygiene (of CL's & CL storage case)
- › Solutions (peroxide cleaners most effective)
- › Wearing time (follow recommendations)

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## Trouble Shooting Problems

- › Tight/ Loose
- › Vasularization
- › Ulcers
- › Spectacle blur
- › Giant papillary conjunctivitis
- › Deposits
- › Pain
- › Keratoconus
- › Edema
- › Solutions
- › Modifications
- › Vision

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## Fitting Too Tight or Too Loose

- › Loose lens:
  - FBS, blur after blink, excessive movement, lens lag, edge stand off
  - Better to start too loose than too tight, adjust to tighter fit as needed
- › Tight lens:
  - "Soreness, without FBS", ghost images/shadows, foggy vision
  - Redness, trapped air under lens, corneal edema, no lens movement

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## Vascularization

- › Development of new blood vessels
- › Due to lack of oxygen or corneal irritation from CL
- › Recommend higher Dk/L &/or looser lens fit
- › Worst case: discontinue CL use temporarily or permanently
- › Pannus: blood vessels growing from outside

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## Ulcers

- › Infiltration of corneal tissue
  - Bacterial, viral, fungal, protozoan (acanthamoeba)
- › Can be caused by lack of oxygen
- › Possibility of corneal perforation
- › Sterile vs. infectious
- › Marginal vs. central
- › If recurrent, check if pt is immunocompromised

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## Problems

- › Lens deposits
- › GPC
- › Pain
- › Vasularization



[webeye.ophth.uiowa.edu](http://webeye.ophth.uiowa.edu)



[cornealclinic.com](http://cornealclinic.com)



[ilupp.all.rmit.edu](http://ilupp.all.rmit.edu)

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## Spectacle blur

- › Can be caused by
  - Corneal molding (warping)
  - Corneal edema (swelling, changes in K readings)
  - Combination of both
- › Can last from minutes to weeks before resolves after D/C CL's
- › RGP higher effect than Soft CL's

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## Lens Deposits

- › Protein deposits
- › Calcium deposits
- › Inadequate cleaning method or solution
- › May need enzymatic cleaner
- › Can cause GPC
- › Possible allergic response to deposits
- › As deposits worsen, wearing time tolerability lessens

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## Protein Deposits

Soft CL



Dirty lens after wear



Same lens after rinse



Same lens after rub and rinse



RGP

[www.amsurecare.com](http://www.amsurecare.com)  
[www.bausch.com](http://www.bausch.com)

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## Keratoconus

- › Thinning of cornea, bulging corneal tissue
- › Irregular astigmatism
- › Progressive steepening as ectasia worsens
- › RGP can correct for early to mid-stage KCN
- › RGP acts as new front surface for refraction
- › Munson's sign and bulge, as pt looks down, examiner can see the bulge

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## Verification of Lenses

- › Power
- › Base curve
- › Diameter
- › Central thickness
- › Edge profile
- › Instruments: radiuscope (b.c. of lens), V-groove, Loupe, Shadowgraph, Lensometer (power of hard or RGP lens)

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## Equipment Maintenance and Repair

(4% of Exam)

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## Instrument Maintenance

- › Acuity Projectors
- › Ophthalmoscopes
- › Retinoscopes
- › Lensometers
- › Perimeters
- › Tangent Screen
- › Phoropters
- › Slit Lamps
- › Ultrasound biometry
- › Keratometers
- › Lenses
- › Tonometers
- › Muscle Light
- › Special Instruments (Equipment)
- › Surgical Instruments

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## Acuity Projectors

- › Used to measure visual acuity
- › Electrical connections
- › Projector-blow off dust
- › Slides-lint-free cloth, photo-paper, replace darkened slides
- › Bulb-avoid touching with your fingers (oil! lessen the life of bulb)
- › Screens-
- › Mirror-use only canned air or specified cleaning cloths
- › Other



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## Ophthalmoscopes

- › Used to visualize/examine inside of the eye, usually the fundus
  - Direct
  - Indirect
- › Electrical connections or battery
- › Bulb
- › Loose lenses (20D, 90D, others)



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## Retinoscopes

- › Used to conduct retinoscopy (objective observation of refractive error)
- › Front mirror-blow off dust
- › Battery- Lithium ion, rechargeable
- › Bulb-store instrument upright, filaments bend/distort light if stored horizontally



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## Lensometers

- › Used to measure the refractive power of the lenses in glasses (or RGP/hard CLs)
- › Manual lensometer
  - Cleaning lenses (blow off dust), dials (soft cloth), stands (do not lubricate/call professional)
- › Auto-lensometer
  - Electrical connections
  - Cleaning lenses, stands
  - Utilizing correct modes



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## Perimeters

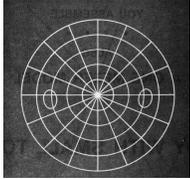
- › Used to measure field of vision
  - Humphrey visual field
  - Goldmann visual field
  - Other
- › Calibrating lighting conditions
- › Cleaning
- › Maintenance
- › Trial lens maintenance



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### Tangent Screen

- Used to measure field of vision
- Maintenance of tangent screen



The 1-meter black felt screen is mounted on a spring roller with mounting brackets. It also comes with a 1-1/2mm white test object, 18" wand, black marking pins and 50 double chart sheets.

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### Phoropters

- Used for the measurement of refractive error including sphere, cylinder, axis, distance and near, with/without prism, IPD, level, etc.
- Cleaning lenses—blow off dust, lens tissue
- Face shields—clean &/or exchange as needed
- Other maintenance—always let a professional service inside the phoropter ~Q2yrs
- Do not use alcohol of phoropter (except face shields)



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### Slit Lamps

- Used to examine the eye at various magnifications; also used for tonometry
- Electrical connections
- Bulb – rotate
- Cleaning the:
  - lenses/mirrors (dust brush/cloth/photo-glass cleaner & cotton balls)
  - stand (clean the pad, sewing machine oil at ball joint)
- Maintenance of joystick, dials, etc.
- Calibration of tonometry unit




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### Ultrasound

- A-scans and/or B-scans used to measure axial length and/or orbital abnormalities
- Electrical connections
- Cleaning the probe
- Maintenance of probe, foot pedal, unit, printer (changing paper)
- Calibrating the unit



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### Keratometers

- Used to measure the corneal curvature, determine amount/location of astigmatism, identify corneal irregularities
- Electrical connections
- Bulb—check for deposits/darkening, & replace as needed
- Occluder
- Check calibration with silver calibration spheres; call service professional if needed




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### Lenses

- Used to magnify a view of the eye for examination
- Cleaning, maintenance, and storage
  - Loose lenses
    - Non-contact: Hruby lens, Condensing lenses, fundusoscopic lenses
    - Contact: Gonio, fundus contact lens, Koeppel lens
  - Trial lenses
    - Gonio lenses
    - RGP/hard contact lenses
    - Soft contact lenses (Bandage CLs)
- Manufactures instructions





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### Tonometers

- Used to measure intraocular pressure (IOP)
- Cleaning, maintenance, and storage
  - Goldmann
  - Tonopen
  - Non-Contact tonometer
  - Perkins tonometer
  - Schiötz tonometer
  - Other




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### Muscle Light

- Used to illuminate external and some internal structures of the eye; used as a fixation focal point
- Battery
- Bulb—store instrument upright, filaments bend/distort light if stored horizontally




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### Special Instruments (Equipment)

- Used to measure various elements of structure and performance of the eye
- Cleaning, maintenance, and storage
  - Auto-refractor
  - Pachymeter
  - Endothelial Cell Count/Specular Microscopy
  - Topography units
  - OCTs, HRTs
  - Cameras
  - Other



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### Surgical Instruments

- › Used to perform various surgical procedures
- › Cleaning/ Sterilizing of instruments
- › Clean, maintenance, and storage
  - Sharps
  - Disposables
  - Reusable instruments
  - Microscopes
  - Loupes



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## Lensometry

(5% of Exam)

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### Neutralize Spectacles

- › Used to **neutralize** or "read" a prescription from a pair of glasses, loose lenses or rigid contact lenses.
- › Used to locate optical centers of lenses.
- › Used to "read" prism in lenses.
- › Used to "read" bifocals, trifocals (adds)

84

### Lensometry

- › Sphere
- › Cylinder power/axis
- › Prism
- › Multifocal power
- › Multifocal induced prism
- › Base curve
- › Lensometer
- › Lens "clock"
- › Estimation with loose lenses
- › Aphakic lenses
- › Recording prescription
- › **Transposition**

85

### Automated Lensometer

- › Several brands on the market
- › Measures quickly and accurately the sphere, cylinder, axis and prism of a lens.
- › Digital display can be printed on paper tape.
- › No focusing of eyepiece or target is required.
- › Eliminates need for mathematical determination of cylinder or add power.

86

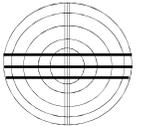
### Manual Lensometer



87

### Measuring Glasses

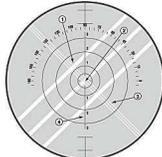
- › **Focus Eyepiece**
- › Place spectacles on the platform so that both lenses are resting on the platform.
- › Center the target
- › Focus target using the power wheel and axis wheel.



Manual Lensometer Target

88

### Spherical Lenses



- › All target lines come into focus at the same time.

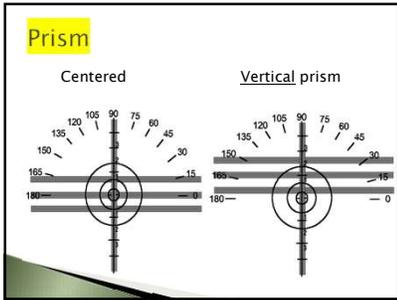
89

### Astigmatic Lenses



- › Thin target lines and wide target lines come into focus at different times. (Here the thin lines are in focus, but wide lines are not.)

90



91

### Manual Lensometry Measurement

▶ When reading a pair of glasses, the first reading (thin lines) is +3.00. The second reading (wide lines) is -1.00. The axis reads 45. Write the prescription.

Answer: +3.00 -4.00 x 45

92

### Fresnel Prism

▶ Prism "sticker" adhered to glasses

93

### Ground-In Prism

- ▶ Prism added to the glasses to accommodate for an abnormal eye turn
- ▶ Decreases or eliminates diplopia
- ▶ Increases vision quality and depth perception

94

### Slab Off

▶ Used when anisometropia causes vertical imbalance in a set of bifocal lenses

95

### Geneva lens clock

Measures lens base curve

96

### Aphakic glasses

Usually +10 to +16D

97

### Keratometry

(5% of Exam)

98

### Keratometer or Ophthalmometer

99

## Keratometry

- › Measures the central curvature of the anterior cornea
- › Readings are called K-readings
- › Measures in two meridians
- › Measured in diopters
- › Average cornea has a power of 42-44 D

100

## Uses for Keratometry

- › Contact lens fitting
- › IOL calculations
- › Keratoconus detection
- › Irregular cornea detection

101

## Steps to Performing Keratometry

- › Focus the eye piece
- › Instruct the patient
- › Position the patient
- › Position the keratometer
- › Focus the mires
- › Locate the axis by rotating the drum
- › Align the plus signs and minus signs
- › Read/Record the measurement

102

## Horizontal Dial



103

## Vertical Dial



104

## Medical Ethics, Legal and Regulatory Issues

(3% of Exam)

105

## Third Party Coding

- › Basic understanding of chart documentation to meet coding requirements
- › Basic understanding of coding levels
- › E&M codes - Evaluation & Management

106

## Government and Institutional Rules and Regulations

- › HIPAA regulations
- › Research related guidelines

107

## Confidentiality

The patient's right to privacy.

108

## Quality Assurance

- › Protecting patient privacy
- › Trained, skilled competent staff members
- › Equipment is calibrated/cleaned/good working order

109

## Ethical & Legal Standards

- › Professional conduct
- › Code of Ethics
- › Respect and Sensitivity
- › A patient's chart is a legal document and should be treated as such.

110

## HIPAA

- › **Health Insurance Portability and Accountability Act of 1996**
- › Restricts use and disclosure of health information
- › Confidential communications concerning patient's condition and treatment
- › Printed copy of the privacy practice of the provider

111

## Informed Consent

- › Patients have the right to make the decision about what they will and will not allow.
- › Patient is educated and asked to help in the decision making process.
- › **Patient must be informed of common and uncommon risks.**
- › These steps must be documented in the patient's chart.

112

## Microbiology (3% of Exam)

113

## Office Antisepsis

- › The technique of preventing infection and the growth of microorganisms.
- › **Never touch the eye with a dropper bottle or ointment tube during instillation of meds.**
- › Clean tonometer tips properly.
- › Use tonopen covers.
- › Wipe down equipment, occluders, chin rests, forehead straps, chairs, etc. between patients.

114

## OSHA Regulations

- › Personal Protective Equipment
- › How to handle a blood spill
- › What to do if a needle-stick occurs
- › Sharps containers
- › BioHazard containers

115

## Fundamentals of Microbial Control

- › **Universal Precautions:**
  - › **Treat every patient as though he or she has an infectious disease.**
- › Sanitation
  - › Hand hygiene- VERY important
  - › Personal Protective Equipment (PPE)
- › Contamination
  - › Safe handling & disposal of sharps/waste

116

## Specimens and Biopsies

- › Ocular Fluid or tissue samples collected for evaluation of abnormalities
  - › Lid
  - › Corneal
  - › Conjunctival
- › Collected in Surgery or Clinic

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## Bacterial Cultures

- › Scrapings or smears of ocular tissues collected for evaluation of infection or disease

PLATES:

- › Chocolate
- › Blood
- › Sabouraud
- › Mannitol Salt



compbell lab

118

## Pharmacology

(5% of Exam)

119

## Drug Delivery

- › **Topical Administration**
  - › Drops (Solution vs. Suspension vs. Emulsion)
    - Advantage: Easy, quick absorption into eye with systemic absorption
    - Disadvantage: May not penetrate cornea, may not extend beyond anterior segment
  - › Ointments
    - Advantage: longer contact time, more difficult for kids to flush away with tears
    - Disadvantage: blurred vision, longer contact time may irritate cornea
  - › Sustained release
    - Advantage: longer contact time, dose less often
    - Disadvantage: uncomfortable, can dislodge



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## Drug Delivery (continued)

- › Injections
  - IV (intravenous)- rapid absorption
  - IM (intramuscular)- for slower absorption of higher doses
  - Periocular- inject around the eye
  - Retrobulbar- behind the eye
  - Subconjunctival- under the conjunctiva
  - Intracameral- into the anterior chamber
  - Intravitreal- into vitreous
- › Systemic (oral)
- › Complications of each



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## Drug Delivery (continued)

- › **Systemic (oral)**
  - Advantage: increased compliance, less hassle than eye drops/ointments, longer lasting effects
  - Disadvantage: systemic absorption, possible adverse reaction, longer lasting effects



www.drugs.com

122

## Instillation and Identification

- › Describe proper instillation
- › Identify classes of drops, color of caps, generic names

123

## Educate Patients on Medications

- › Hygiene
- › Proper instillation
- › Proper Storage
- › Dosing
- › Compliance
- › Expiration and Usage

124

## Drug Reactions

- › Allergies
- › Side Effects
- › Contraindications

125

## Ocular Pharmacology

- › **Diagnostics:**
  - Topical Anesthesia
  - Mydriatics and Cycloplegics
  - Ophthalmic Dyes
- › **Therapeutics:**
  - Antibiotics (bacteriostatic, bacteriocidal)
  - Antivirals
  - Antifungals
  - Glaucoma (reduce aqueous production/increase outflow)
  - Dry Eye/Mast Cell Stabilizers
  - Corticosteroids
  - NSAIDS
  - Combination Drugs
  - Allergy/ Antihistamines

126

## Ocular Pharmacology

► **Therapeutic Ophthalmic Drugs:**

- A drug used to treat an ocular disease

<b>Local</b>	<b>Systemic</b>
<ul style="list-style-type: none"> <li>• Eye Drops</li> <li>• Ointment</li> <li>• Gel</li> <li>• Periocular (sub-conj, sub-tenons, peribulbar, retrobulbar)</li> <li>• Intraocular (intracameral, intravitreal)</li> </ul>	<ul style="list-style-type: none"> <li>• Oral</li> <li>• IV</li> <li>• Intramuscular</li> </ul>

127

## Ocular Pharmacology

► **Understanding the Color Code:**

- TAN: anti-infectives or anti-microbials
- PINK: anti-inflammatories or steroids
- GRAY: NSAIDs
- RED: mydriatics or cycloplegics
- GREEN: miotics
- YELLOW/BLUE: beta-blockers
- PURPLE: adrenergic antagonist
- ORANGE: carbonic anhydrase inhibitors
- TURQUOISE: prostaglandin analogues

128

## Ocular Motility

(5% of Exam)

129

## Basic Ocular Motility

**DEFINITIONS:**

- **Fixation:** maintaining the gaze in a constant direction
- **Vergence:** simultaneous movement of both eyes in opposite directions to obtain/maintain single binocular vision
  - Convergence: simultaneous inward movement of eyes
  - Divergence: simultaneous outward movement of eyes
- **Ductions:** an eye movement involving one eye
  - Abduction: Horizontal lateral eye movement
  - Adduction: Horizontal medial eye movement
  - Supraduction: Vertical upward eye movement
  - Infraction: Vertical downward eye movement
- **Versions:** an eye movement involving both eyes moving synchronously and symmetrically in the same direction

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## Basic Ocular Motility

**DEFINITIONS: CONT'D**

- **Saccade:** fast eye movements that move the eye from one target to another
- **Pursuit:** slow, smooth eye movements that track a target
- **Nystagmus:** a form of involuntary eye movement characterized by alternating smooth pursuit in one direction and saccadic movement in the other direction
- **Accommodation:** the process by which the eye increases optical power to maintain a clear image (focus) on an object as it draws near
- **Stereopsis:** the ability of the eyes and brain to interpret a presented image as three dimensional

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## Basic Ocular Motility

**DEFINITIONS: CONT'D**

- **Tropia:** misalignment of one eye, relative to the other, during binocular viewing
- **Phoria:** Similar to strabismus, except the deviation only occurs after binocular vision is interrupted
- **Amblyopia:** the lack of development of normal sight in one eye during childhood, because the unaffected eye is favored by the brain
- **Pseudostrabismus:** the false appearance of crossed eyes
- **Anisometropia:** unequal refractive error between the two eyes

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## Basic Ocular Motility

**DEFINITIONS: CONT'D**

- **Sherrington's Law:**
  - Every unit of innervation to the agonist is accompanied by a reciprocal amount of relaxation to the antagonist muscle.
  - **Example:** If the medial rectus contracts, the lateral rectus of the **same eye** must relax
- **Herring's Law:**
  - The fixing eye determines how much innervation goes to the **agonist** of that eye. An **equal and simultaneous** amount of innervation then goes to its yoke (helper) in the other eye.
  - **Example:** the medial rectus of the right eye works with the lateral rectus of the left eye to turn both eyes to the left

133

## Functions

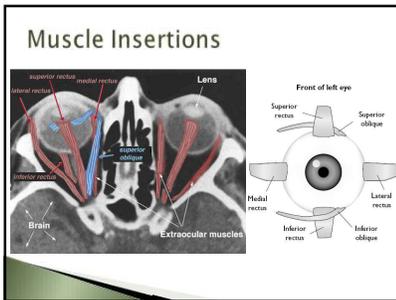
- Used to detect weakness in the extraocular muscles
- Test the horizontal, vertical and oblique meridians.
- Primary and the eight cardinal positions of gaze

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## Anomalies

- Strabismus
  - Eso-, Exo-, Hyper-, Hypo-
  - Tropias
  - Phorias
- Amblyopia
- Suppression
- Diplopia

135



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### Extraocular Muscle Actions

Muscle	Primary Function	Secondary Function	Tertiary Function
Medial rectus	Nasal (adduction)	None	None
Lateral rectus	Temporal (abduction)	None	None
Superior rectus	Upward (elevation)	Incyclotorsion	Adduction
Inferior rectus	Downward (depression)	Excyclotorsion	Adduction
Superior oblique	Incyclotorsion	Depression	Abduction
Inferior oblique	Excyclotorsion	Elevation	Abduction

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### Muscle Innervation

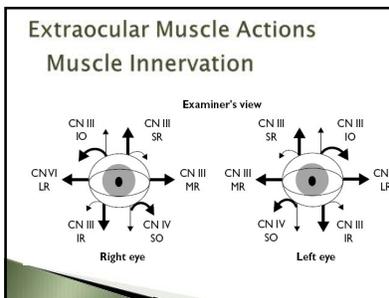
Muscle	Innervating Nerve
Superior oblique	CN IV (Trochlear Nerve)
Lateral rectus	CN VI (Abducens Nerve)
Superior rectus	CN III (Oculomotor Nerve)
Inferior rectus	CN III (Oculomotor Nerve)
Medial rectus	CN III (Oculomotor Nerve)
Inferior oblique	CN III (Oculomotor Nerve)

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### Muscle Innervation mnemonic

LR 6 (VI)  
 SO 4 (IV)  
 All the rest are 3 (III)

139



140

### Strabismus

**Tropia:**

- A misalignment of one eye, relative to the other, during binocular viewing
- It typically involves a lack of coordination between the EOM's which prevents bringing the gaze of each eye to the same point in space and preventing proper binocular vision

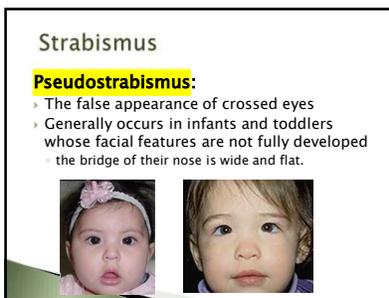
141

### Strabismus

**Phoria:**

- Deviation of the eyes occurring after binocular vision is interrupted
- If you remove the sensory information about the eye's position in the orbit (alternating cover test), there is no stimulus to binocular fusion, and the eye will move to a position of "rest"
- The difference between this position, and where it would be were the eye uncovered, is the phoria
- Usually asymptomatic unless it is not overcome by fusional vergence, and then signs and symptoms appear (decompensated phoria)

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### Amblyopia Detection

**Refractive or Anisometric Amblyopia:**

- Refractive amblyopia may result from anisometropia
- The eye which provides the brain with a clearer image typically becomes the dominant eye
- The image in the other eye is blurred, which results in abnormal development of one half of the visual system

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## Amblyopia Detection

### Form-Deprivation Amblyopia:

- › Results when the ocular media become opaque
  - ex: cataracts or corneal scarring
- › Opacities prevent adequate visual input from reaching the eye, and therefore disrupt development
- › If not treated in a timely fashion, amblyopia may persist even after the cause of the opacity is removed
- › Ptosis or some other problem causing the upper eyelid to physically occlude a child's vision, may also cause amblyopia

145

## Amblyopia Detection

### Strabismic Amblyopia:

- › Strabismus usually results in normal vision in the preferred sighting eye, but may cause abnormal vision in the deviating eye
- › Children's brains can suppress images from one of the eyes, eliminating the double vision
- › This interrupts the brain's normal development, resulting in the amblyopia

146

## Evaluation Assessment Methods (cont'd)

### Cover Test:

- › Determine the presence, magnitude, direction and frequency of tropias and phorias.
- › **Unilateral Cover (Cover-Uncover) Test**
- › **Alternating Cover Test**



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## Evaluation Assessment Methods (cont'd)

### Unilateral Cover (Cover-Uncover) Test:

- › Direct the patient to look at the fixation target
  - test distance 1st, then near
- › For testing of the right eye, place the occluder over the patient's left eye while closely observing the patient's right eye for movement after the left eye is covered
- › Repeat for left eye
- › If no movement of either the right or left eye is detected, the patient does not have a tropia
  - proceed to alternating cover test to detect the presence of a phoria
- › If movement of the fellow eye is detected when testing either the right or left eye, the patient has a tropia

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## Evaluation Assessment Methods (cont'd)

### Unilateral Cover (Cover-Uncover) Test:

- › Note direction -
  - Exotropia - deviating eye moves inward after the fellow eye is covered
  - Esotropia - deviating eye moves outward after the fellow eye is covered
  - Hypertropia - deviating eye moves down after the fellow eye is covered
  - Hypotropia - deviating eye moves up after the fellow eye is covered
- › Note laterality - R, L, or alternating
- › Note frequency - Constant or intermittent
- › Proceed to alternating cover test to measure the magnitude of deviation

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## Evaluation Assessment Methods (cont'd)

### Alternating Cover Test:

- › The occluder is introduced and held in front of the eye for 1-2 sec and then moved quickly to the other eye and held in place for 1-2 sec
  - repeat at least 3 times - not allowing binocular fixation to occur
- › If no movement, the patient does not have a phoria or tropia
- › If a phoria is detected, note the direction -
  - Exophoria - eye moves inward after the fellow eye is covered
  - Esophoria - eye moves outward after the fellow eye is covered
  - Hyperphoria - eye moves down after the fellow eye is covered
  - Hypophoria - eye moves up after the fellow eye is covered
- › Neutralize deviation using prism

150

## Evaluation Assessment Methods (cont'd)

### Hirschberg's test:

- › To detect the difference between strabismus and pseudostrabismus
- › Direct a penlight into the child's eyes
- › When the child is looking at the light a reflection can be seen
- › If the eyes are aligned with one another then the reflection from the light will be in the same spot of each eye
- › If strabismus is present then the reflection from the light will not be in the same spot of each eye

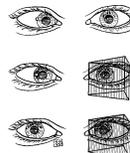


151

## Evaluation Assessment Methods (cont'd)

### Krimsky Prism Test:

- › Neutralize the Hirschberg reflex with prism
- › Place prism before the fixating eye until the light reflexes are symmetrical

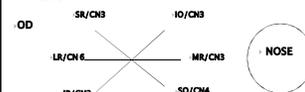


152

## Evaluation Assessment Methods (cont'd)

### Diagnostic Positions of Gaze:

- › This test evaluates the functioning of the six extraocular muscles and cranial nerves III, IV, and VI



153

Evaluation Assessment Methods (cont'd)

**Maddox Rod:**

- Used to objectively measure a heterophoria by placing maddox rod in front of one eye of a subject and viewing a spot of light binocularly
- The Maddox rod and eye together form a long streak of light perpendicular to the axis of the grooves and this retinal image is so unlike the image formed in the other eye that the fusion reflex is not stimulated



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Evaluation Assessment Methods (cont'd)

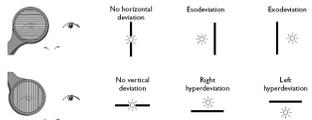
**Maddox Rod: cont'd**

- If there is a phoria the streak of light will not intersect the spot of light
- For horizontal phorias the rod axis is placed horizontally and for vertical phorias, vertically
- The amount and type of the phoria can be quantified by placing a prism of appropriate power and direction in front of either eye such that the streak appears superimposed on the spot of light

155

Evaluation Assessment Methods (cont'd)

**Maddox Rod: cont'd**



156

Evaluation Assessment Methods (cont'd)

**Worth 4-Dot Test:**

- A clinical test for suppression
- Patient wears glasses with a red lens over RIGHT and a green lens over LEFT eye
- The patient is shown a modified flashlight with four holes
  - Traditionally, the holes are arranged with the top hole showing only red light, the left and right showing only green light, and the bottom showing white light
- Because the red filter blocks the green light and the green filter blocks the red light, it is possible to determine if the patient is using both eyes simultaneously

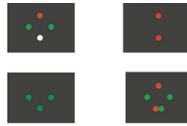


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Evaluation Assessment Methods (cont'd)

**Worth 4-Dot Test: cont'd**

- Normal binocular vision = four lights
- Eye behind red lens (right) is suppressed = three lights
- Eye behind green lens (left) is suppressed = two lights
- Patient has diplopia = five lights



158

Evaluation Assessment Methods (cont'd)

**Stereopsis (Titmus Fly Stereotest):**

- Consists of various vectograms
  - including one with a stereoscopic pattern representing a housefly
  - approximately 3000 seconds of arc of retinal disparity at 40 cm
- The other vectograms of the test provide finer tests for stereoscopic acuity



159

Evaluation Assessment Methods (cont'd)

**Near Point of Convergence (NPC):**

- This test measures the distance from your eyes to where both eyes can focus without double vision
- Hold a small target in front of patient and slowly move it closer until the patient either experiences double vision, or you notices a break in fusion
  - or it touches the patients nose
- Record in mm (or to the nose)
- Normal =  $\leq 7$ mm

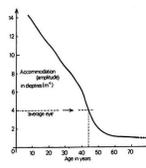


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Evaluation Assessment Methods (cont'd)

**Near Point of Accommodation "Push Up Test":**

- Slowly move relatively small letters closer to the eye until they become blurry
- Measure the distance the letters became blurry
- This is the near point of accommodation



161

**Amblyopia Treatment**

- Patching/Dilation of the "good eye"
- Muscle Therapy
- Strabismus Surgery
- Congenital Cataract Surgery
- Corneal Surgery

162

## Convergence Training

- › Strengthens patient's ability to converge

163

## Nystagmus

- › Involuntary rapid movement of the eyeball
- › May be lateral, vertical, rotary or mixed.
- › Occlusion of one eye may make nystagmus greater.
- › Visual acuity is usually better if vision is tested with both eyes.
- › Null point – The gaze position of least eye movement is the "null point" and tends to be where vision is best.

164

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165

## What's Your Next Step?

- › Study the areas you feel weakest
- › Form a study group
- › Borrow/purchase additional resources
- › Create your own study aides
- › Attend in-services
- › Ask for assistance

*Get Certified!*

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