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

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.

vision expo

1

ABO Advance Review

Thomas Neff MA, LDO, ABO-AC, NCLE-AC
Thomasneffldo@gmail.com

Presented By:

UOA United Opticians ASSOCIATION
Representing Contact Lens and Spectacle Opticians since 1925

Visit the Opticon Hub for more information on joining and helping the UOA with there mission to improve Opticianry!

www.Opticians.org

2

ABO Advance Review Domain 3 & 4

Thomas Neff MA, LDO, ABO-AC, NCLE-AC
Thomasneffldo@gmail.com

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www.Opticians.org

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3

Conflict of interest

- The speaker, Thomas Neff MA LDO, ABO-AC, NCLE-AC, has no conflicts of interest to disclose.
- Part of the Speaker Bureau with Mitsui Chemicals

4

ABO Advance Test Specifications New for 2024

- **1. Optics**
  - **30%**
- **2. Ocular Anatomy, Physiology, Pathology, and Refraction**
  - **33%**
- **3. Ophthalmic Products**
  - **10%**
- **4. Instrumentation**
  - **9%**
- **5. Dispensary Protocols and Procedures**
  - **10%**
- **6. Laws, Regulations, and Standards**
  - **8%**

5

ABO Masters Program

- The ABO Master in Ophthalmic Optics designation demonstrates to the public and colleagues that an individual has attained a superior level in ophthalmic dispensing.
- Any Optician who is currently Advanced Certified by the American Board of Opticianry for at least one complete three-year renewal cycle and satisfies one of two additional qualifications is eligible to apply for this designation.

6

ABO Masters Program

Have written two published ABO-approved Advanced Level III articles

OR

An ABO-approved speaker with two ABO-approved Advanced Level III Courses, or

OR

Have one published ABO-approved Advanced Level III article AND one ABO- approved Advanced Level III Course for which you are the ABO-approved Speaker.

7

Domain 3
Ophthalmic Products

Thomas Neff MA, LDO, ABO-AC, NCLE-AC

8

Domain 3 Tasks

Ophthalmic Products: 10%

I. Lenses and lens treatments
II. Low Vision Aids
III. Preassembled eyewear
IV. Lens options for various occupations and specific lifestyle activities

9

Lens Options

- Anti-Reflection treatment/thin film:
  - Driving/less glare
  - Appearance
  - indoor reading.
- Polarized lenses:
  - Glare protection,
  - Driving reflected glare
  - Water sports, fishing , boating.
- Photochromic:
  - Ocular health
  - cataracts,
  - pinguecula
  - outdoor occupations/recreation
- Scratch coating:
  - Better vision
  - longer lens life.

10

Lens Options

- High Index lenses:
  - Improved appearance (thinner)
  - comfort (lighter)
- Aspheric lenses:
  - Improved appearance (thinner, less magnification)
  - better vision (less peripheral aberrations)
  - comfort (lighter)
- Digitally Surfaced: High definition optics
  - Better Vision
  - Customized optics/PALs

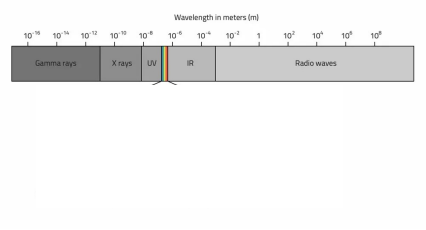
11

Optical Theory

- Metric System
- Light
- Lens Material Characteristics
- Lens Design
  - Plus Lenses
  - Minus Lenses
  - Compound Lenses
  - Lens Power

12

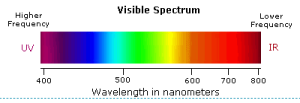
Electromagnetic Spectrum



13

Electromagnetic Radiation

- Ultraviolet
  - UVC: 200-275 nm Ozone Layer
  - UVB: 275-330 nm Sunburn
  - UVA: 330-400 nm Ocular Hazard
- Visible Light
  - 400-750 nm ROY G BIV
- Infrared - Heat
  - 750-1,000,000 nm



14

The Metric System

- **1 meter = 39.37 inches**
- 1 meter = 10 decimeters
- **1 meter = 100 centimeters**
- **1 meter = 1000 millimeters**
- **1 meter = 1,000,000 micrometers/microns**
- **1 meter = 1 billion nanometers (nm)**

15

Light

- Dual nature of light
  - Particles (photons)
  - Waves
- For our purposes easiest and most clinically relevant to deal with Waves

16

Light

- Light diverges from a source in waves
- Light striking a different medium is:
  - reflected
  - refracted
  - absorbed

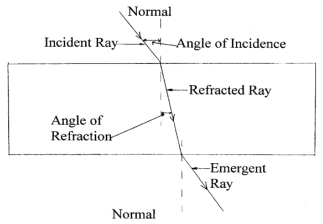
17

Index of Refraction

$$N = \frac{Speed\ of\ light\ in\ air\ (186{,}000mps)}{speed\ of\ light\ in\ medium}$$

18

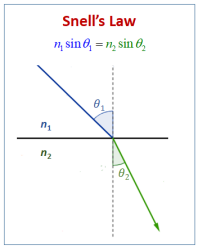
Law of Refraction: A light ray passing obliquely from a medium of lesser density to one of greater density will be bent toward the normal



19

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

n_1 = incident index
n_2 = refracted index
θ_1 = incident angle
θ_2 = refracted angle



20

Plus Lens Characteristics

- Can visualize as "base to base" prisms increasing in power from the center to the edge.
- Thicker at the center.
- Magnify
- Exhibit "Against Motion"
- Designs:
  - Equiconvex, Biconvex
  - Flat Convex
  - Meniscus

21

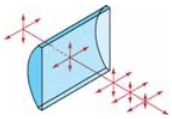
Minus Lens Characteristics

- Series of apex to apex prisms increasing in power from the center to the edge.
- Thinnest at the center.
- Minify
- Exhibits "With Motion"
- Designs:
  - Equiconcave, Biconcave
  - Flat Concave
  - Meniscus

22

Compound Lens Characteristics

- Combine a spherical surface with a toric or cylindrical surface.
- Strongest and weakest curves are 90 degrees apart.
  - Plus cylinder form has cylinder on the front
  - Minus cylinder form has cylinder on the back.



23

Compound Lens Characteristics

- SPH is throughout ENTIRE lens
- Cyl based upon meridian:
  - Meridian that corresponds with rx Axis represents 0% cylinder power.
  - 90 degrees away = Full Cyl
  - Remember LENS CROSS!!!

24

Lens Power

- The power of a lens in diopters is equal to the reciprocal of it's focal length in meters

$$D = 1/f$$

$$f = 1/D$$

D = dioptric power of lens (in D)
F = focal length of lens (in M)

25

Lens Power: Examples

1D = 1M

2D = .5M

0 .25D = 4M

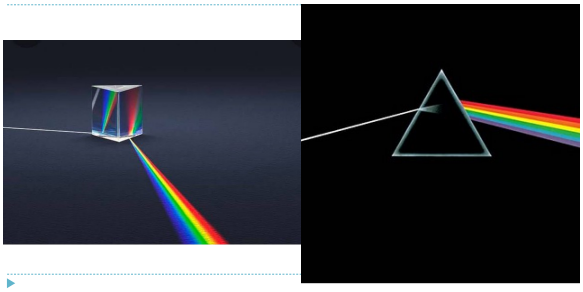
26

Lens Material Characteristics

- When light strikes a new medium at an angle, the change in speed causes it to change direction.
  - Index of Refraction(n): higher index = slows light more = greater/more effective change in direction
  - Abbe Value: The higher the value = LESS chromatic aberration present in a lens.
    - Higher is better
  - Specific Gravity:
    - The ratio of the weight of a substance:weight of water with the same volume.
    - OR grams/cm^3
      - Higher = heavier per cm^3
      - Lower = lighter per cm^3

27

Lens Material Characteristics



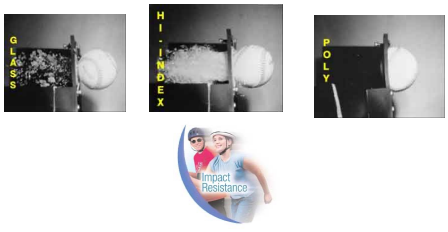
28

Lens Materials

MATERIAL	INDEX	SPEC. GR.	ABBE
Crown	1.52	2.54	59
CR-39	1.498	1.32	58
Trivex	1.53	1.11	45
Thin&Lite	1.60	1.34	36
Polycarbonate	1.59	1.20	31
Glass (crown)	1.70	2.99	32

29

Impact Resistance:



30

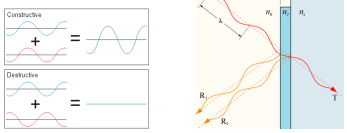
Tints and Coatings

- Ultraviolet coating: Block UV light to 400nm.
- Tints: Glass - Metal oxides added for color
  Plastic - Lenses dyed to color
- Photosensitive: UV darkens, IR lightens
- A/R coating / treatment:
  - 1/4 wave length thick (for a given wavelength)
  - material n= equal to square root of lens (magnesium fluoride)
  - Destructive interference

31

Tints and Coatings

- A/R coating: 1/4 wave length thick, material equal to square root of lens (magnesium fluoride)



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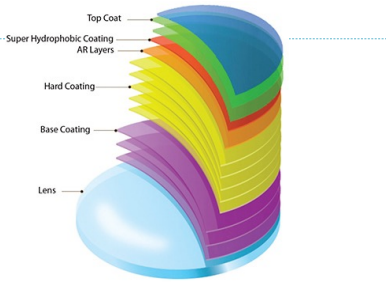


https://www.eyecarebusiness.com/issues/2015/february-2015/understanding-ar

33

Ultraviolet Wave-Length

- Eyes are affected by exposure to ultraviolet radiation
- Overexposure to UV light contributes to the development of cataracts, retinal damage and other eye problems
- Experts report that as much as 80% of UV damage to our eyes occurs before the age 18
- Wavelengths of UV Radiation include UV-A, UV-B and UV-C
  - UV-C (100 to 280 nanometers) (absorbed by the ozone) Most dangerous
  - UV-B (280 to 325 nm) is the most harmful wavelength to the eye, more prevalent in the summer months, responsible for causing most skin cancers
  - UV-A (315 to 380 nm) is the lowest energy level, but it still carries the potential to harm the eyes. contribute to skin ageing and wrinkling because they are able to penetrate deepest into the skin

34

Polarization

- Block Horizontal (Blinding) Glare
- Gray and Brown Tints are Most Common
- Back A/R can be applied to further reduce glare
- Outside Daytime Use Only
  - Daytime Driving
  - Fishing/Boating
  - Skiing/Snow Sports
  - Beach/Water Sports

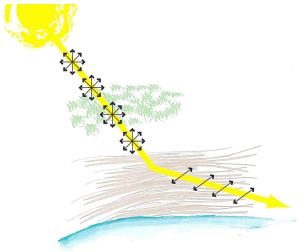


Figure 22-19. When light strikes a horizontal reflecting surface, such as water or sand, it becomes partially polarized with the major direction of vibration being in the horizontal plane.

35

Polarization

To reduce the intensity of reflective glare more than that of surrounding objects, a filter that absorbs the horizontally vibrating components of light would be useful.

Such a filter is available for ophthalmic use and is made from a sheet of polyvinyl acetate (PVA).

- The PVA is first stretched to five times its normal length in one direction.
- Then it is dipped in iodine.
- The iodine is absorbed into the chains of molecules in the PVA.
- These darkened lines create the polarizing filter.

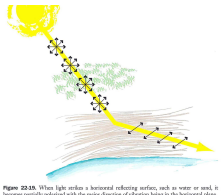


Figure 22-19. When light strikes a horizontal reflecting surface, such as water or sand, it becomes partially polarized with the major direction of vibration being in the horizontal plane.

36

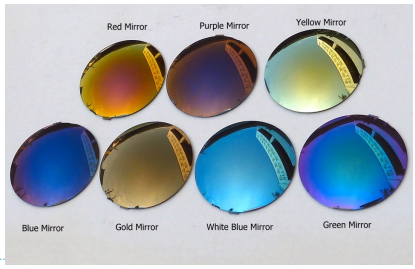
Mirrors

Purpose:

- Reflect more light form lens so it lowers the transmission of light making the lenses "Darker"

Types

- Metallized – Thin Layer that absorbs and reflects light
- Dielectric – Allows more light to pass through



37

Domain 4
Instrumentation

Thomas Neff MA, LDO, ABO-AC, NCLE-AC

38

Domain 4 Tasks

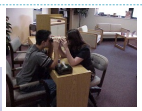
I. **Instrumentation– 9%**

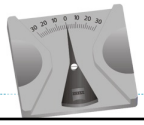
a) Use of lens power measuring devices
b) Use of Lens Measurement Devices
c) Optical Instrumentation
d) Lens measurement systems and conversions

39

Measurements Facial and Frame

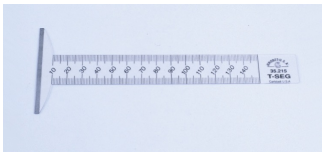
- Interpupillary Distance
  - MM Rule
  - Pupilometer
  - Electronic
- Vertex Distance
  - Distometer
  - Electronic
- Pantoscopic Tilt
  - Manual
  - Electronic
- Wrap
  - Manual
  - Electronic

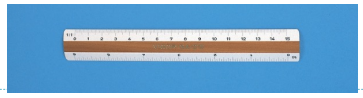




40

Millimeter Rule





41

Pupilometer

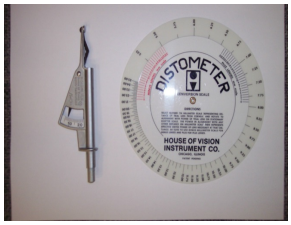
CRP, or Corneal Reflex Pupilometer

42

Electronic

43

Distometer



44

45

The Art and Science of Eyewear Fabrication

- Apply formulae used in the manufacture of eyewear.
- Describe the capabilities and limitations of conventional and digital surfacing.
- Explain the lens blank selection process.
- Describe factors that affect lens curves and thickness.
- List the steps from surface layout to finished lens edging.
- Apply verification standards in compliance with ANSI and federal regulations.

46

Lens Fabrication

- Base Curves
- Boxing System
- Minimum Blank Size
- Optical Cross
- Transposition

47

Prescription to Lens Blank

- Material
- Minimum Blank Size
- Vertex Power Compensation
- Resultant Prism
- Nominal Power
- Sagittal Depth Formula
- Thick Lens Back Vertex Power

48

Surfacing Choices

- Conventional Surfacing
- Digital Surfacing

49

Conventional Surfacing

- Spherical, Toric
- Calculations
- Layout
- Blocking
- Generating
- Fining
- Polishing

50

A Basic Surfacing Lab

- Layout Computer
- Marker
- Surface Tape
- Blocker
- Generator
- Cylinder Machine
- Laps
- Lens Inventory

51

Calculations

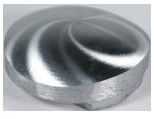
- Frame Measurements
  - MM Rule
  - "C" Gauge
- Frame Tracing Unit
- Software

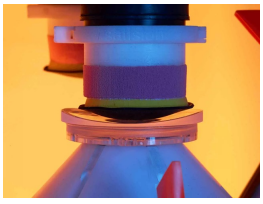
52

Generator

53

Fining and Polishing





54

Basic Surfacing Lab

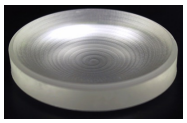
55

Automated Surfacing Lab

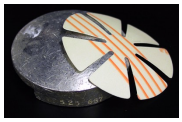
56

Surfacing

- In conventional surfacing, a generator grinds away plastic on back of lens creating rough surface



- Final Rx on back surface is produced by rubbing against an aluminum tool and pad in fining and polishing steps



57

Surfacing

Grinding Curve Questions:

IF you have a -3.00 -2.00 x 180

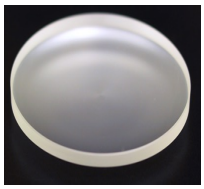
Given a lens with a +3.00 Base Curve

- Transpose Rx:
- What are Grinding Curves
- What is Power at 180?
- What is power at 90
- Type of Astigmatism
- Orientation of Astigmatism

58

Digital Surfacing or Free Form Machining

- A natural diamond cutting tool produces a very smooth surface that requires only light polishing to create transparency



59

Digital Surfacing or Free Form Machining

- Each lens may require over 10 million calculations to generate the data file for the free forming machine to create the lens' surface
- The computer lens design is exact. Several companies use the same machinery. It is each company'ss computer program that determines the end product

60

Schneider HSC 100

61

Free Form Machining

- Create the Following Curves on the back of lens
  - Spherical
  - Aspheric
  - Atoric
  - Progressive
  - Other?
    - Slab off
    - Round/blended on back side
    - etc

62

Finishing Lab

- Lens Layout
- Blocking
- Tracing (prev used Patterns)
- Edging
- Grooving (semi rimless)
- Drilling (rimless)
- Polishing/Tinting (optional)

- FINAL INSPECTION

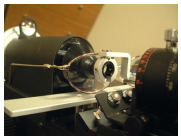
63

Inspection & Verification

64

Lens Verification

1. Focus the Eyepiece
2. Check distance prescription with convex surface facing operator and concave against the lens stop.
3. Always start with the lens with the most power in the vertical meridian
4. Prism: The target is always displaced in the direction of the base.
5. Check add power with the concave surface facing the operator.

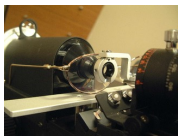


65

Lens Verification

Prism: The target is always displaced in the direction of the base.

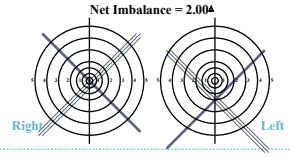
Very important



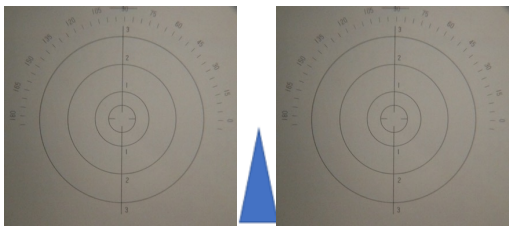
66

Verifying Prism

- Target Displaced in Direction of Base
- Auxiliary Prisms over 5.00 Prism Diopters



67



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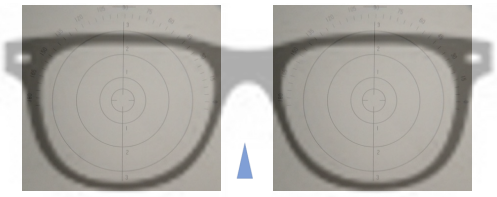

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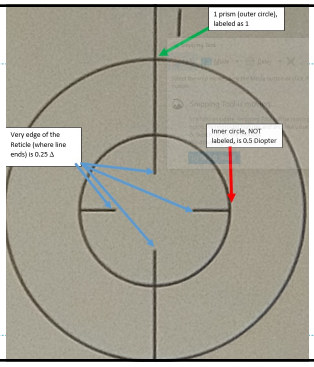
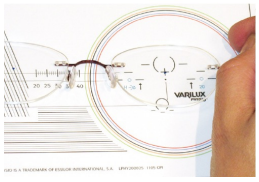


71

Verification: Progressives

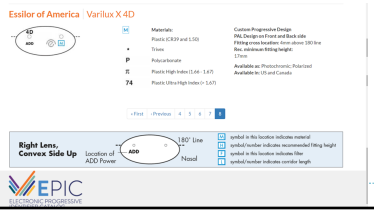
- Remark Lenses



72

Identifying the Lens

- Locate all markings
- The Vision Council Electronic Progressive Lens Identifier
- Shows picture of each type of progressive lens with all hidden markings.



73

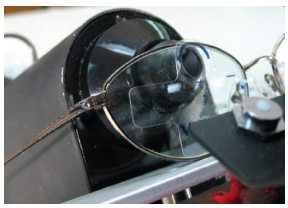
Verification: Progressives

- Locate laser-engraved circles and add power.
- Confirm monocular Pd. and fitting height
- Check distance power
- Check prism at O.C./P.R.P., unless prescribed, prism should be equal in each lens(Prism used for thinning should equal 2/3 the add power)

74

Verification: Progressives

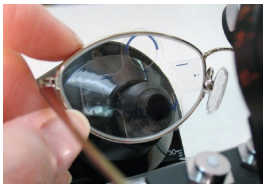
- Check Distance RX through Distance Verification Circle



75

Verification: Progressive Add Power

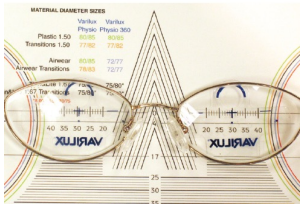
- For Front Surface PAL, Verify with CX Surface against Lens Stop.
- For Back Surface PAL, Verify with CC Surface against Lens Stop.



76

Verification: Progressive Add Power

- Monocular P.D.
- Fitting Height



77

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

Vision Expo Has Gone Green!

We have eliminated all paper session evaluation forms. Please be sure to complete your electronic session evaluations online when you login to request your CE Letter for each course you attended! Your feedback is important to us as our Education Planning Committee considers content and speakers for future meetings to provide you with the best education possible.

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78