PRACTICE EXAM 9

1. A lens has a focal length of 0.40 meters. Its power is:

A. +2.50 D

B. +4.00 D

C. +0.40 D

D. +25.0 D

2. A prescription reads –3.00 –1.00 x 180. The power in the vertical (090) meridian is:

A. –3.00 D

B. –4.00 D

C. –1.00 D

D. –2.00 D

3. A patient looks 8 mm below the optical center of a +3.00 D lens. The induced prism is:

A. 24.0 prism diopters

B. 0.24 prism diopters

C. 3.0 prism diopters

D. 2.4 prism diopters

4. Transpose +1.00 –2.00 x 090 to plus-cylinder form. The result is:

A. +1.00 +2.00 x 090

B. –1.00 –2.00 x 180

C. –1.00 +2.00 x 180

D. +3.00 –2.00 x 090

5. The Abbe value of a lens material measures its:

A. Scratch resistance

B. Ultraviolet blocking

C. Dispersion and chromatic aberration

D. Impact resistance

6. A frame marked 52 □ 16 is fitted to a 64 mm PD. The decentration per lens is:

A. 8 mm inward

B. 4 mm outward

C. 16 mm inward

D. 2 mm inward

7. A plus lens does which of the following to parallel light?

A. Diverges it as from a virtual point

B. Converges it to a focal point

C. Leaves it unchanged

D. Splits it into polarized components

8. The spherical equivalent of –2.00 –2.00 x 180 is:

A. –2.00 D

B. –4.00 D

C. –5.00 D

D. –3.00 D

9. The major reference point and optical center of a lens coincide when:

A. No prism is prescribed

B. The lens is high-index

C. The lens has a strong cylinder

D. The lens is a multifocal

10. A +2.00 cylinder lies at axis 180. At the 090 meridian, the effective cylinder power is:

A. 0% of the cylinder

B. 100% of the cylinder

C. 50% of the cylinder

D. 25% of the cylinder

11. A minus lens is thickest at its:

A. Optical center

B. Geometric center

C. Edges

D. Datum line

12. Which conversion is correct?

A. 1 inch = 2.54 mm

B. 1 inch = 12 mm

C. 1 inch = 10 mm

D. 1 inch = 25.4 mm

13. A patient with a –4.00 D myopic correction has an uncorrected far point at:

A. 4.0 meters

B. Optical infinity

C. 0.25 meters in front of the eye

D. 0.40 meters in front of the eye

14. As index of refraction rises, Abbe value generally:

A. Rises proportionally

B. Falls

C. Stays constant

D. Doubles

15. A patient reads 10 mm below the OCs with vertical powers OD +5.00 and OS +3.00, both base down. The vertical imbalance is:

A. 8.0 prism diopters

B. 5.0 prism diopters

C. 2.0 prism diopters

D. 0.5 prism diopters

16. Which best describes a spherocylindrical lens?

A. It has two principal powers in two principal meridians

B. It has one uniform power throughout

C. It contains only prism

D. It has no measurable power

17. A high-minus lens makes the wearer's eyes appear:

A. Unchanged in size

B. Brighter and clearer

C. Larger than normal

D. Smaller than normal

18. The diopter is defined as the reciprocal of the focal length in:

A. Centimeters

B. Millimeters

C. Meters

D. Inches

19. A +5.00 D lens induces 2.0Δ of prism at a point below the optical center. That point is:

A. 10 mm below the OC

B. 2.5 mm below the OC

C. 4 mm below the OC

D. 0.4 mm below the OC

20. A prism displaces the perceived image toward its:

A. Apex

B. Base

C. Optical center

D. Thickest edge

21. Transposition rotates the cylinder axis by exactly:

A. 45 degrees

B. 180 degrees

C. 30 degrees

D. 90 degrees

22. Light entering a denser medium and slowing bends:

A. Away from the normal

B. Parallel to the surface

C. Toward the normal

D. Back toward its source

23. A focal length of 0.125 m corresponds to a power of:

A. +1.25 D

B. +12.5 D

C. +0.80 D

D. +8.00 D

24. A patient's Rx is plano –1.50 x 090. By focal-line position, this is:

A. Compound myopic astigmatism

B. Simple myopic astigmatism

C. Simple hyperopic astigmatism

D. Mixed astigmatism

25. Which structure provides about two-thirds of the eye's refracting power?

A. The crystalline lens

B. The cornea

C. The vitreous humor

D. The aqueous humor

26. Cones are responsible for:

A. Dim-light peripheral vision

B. Tear production

C. Color and fine detail in bright light

D. Aqueous humor drainage

27. Presbyopia is best described as:

A. The age-related loss of accommodation

B. A clouding of the crystalline lens

C. An unequal corneal curvature

D. Elevated intraocular pressure

28. Glaucoma characteristically causes loss of which field first?

A. The central field

B. The peripheral field

C. The reading zone only

D. The upper field only

29. Hyperopia focuses parallel light:

A. Behind the retina

B. In front of the retina

C. Exactly on the retina

D. On the cornea

30. A phoria differs from a tropia in that a phoria is:

A. Latent and controlled by fusion

B. A constant manifest turn

C. A clouding of the lens

D. A blind spot in the field

31. Which term means a difference in retinal image size between the eyes?

A. Anisometropia

B. Aniseikonia

C. Emmetropia

D. Presbyopia

32. Diabetes can affect vision by causing:

A. A permanently fixed refractive error

B. Immunity to cataract

C. Fluctuating refractive error

D. Improved distance acuity

33. Macular degeneration characteristically affects the:

A. Central field

B. Peripheral field

C. Lower field only

D. Entire field equally

34. Accommodation is performed by the:

A. Iris sphincter

B. Extraocular muscles

C. Ciliary muscle

D. Lacrimal gland

35. Exophthalmos is most associated with:

A. Diabetes

B. Hypertension

C. Rheumatoid arthritis

D. Thyroid disease

36. Rods are primarily responsible for:

A. Sharp color detail in bright light

B. Dim-light and peripheral vision

C. Aqueous humor production

D. Pupil control

37. With-the-rule astigmatism, in minus-cylinder notation, has its axis near:

A. 045 degrees

B. 180 degrees

C. 090 degrees

D. 135 degrees

38. Convergence is the eyes' movement when viewing:

A. A near object

B. A distant object

C. With eyes closed

D. The far periphery

39. A patient needs eyewear for a high-impact sport. The priority material is:

A. Crown glass

B. Polycarbonate

C. Ultra-high index

D. Standard CR-39

40. A semi-rimless nylon-cord frame requires the lens edge to be:

A. Grooved to seat the cord

B. Beveled for full-rim mounting

C. Drilled with holes

D. Left flat and unfinished

41. A polarized lens reduces glare most effectively from:

A. A flat horizontal surface like water

B. A vertical wall

C. Overhead lighting

D. The wearer's lashes

42. A photochromic lens darkens primarily in response to:

A. Infrared heat

B. Ultraviolet radiation

C. Body temperature

D. Visible blue light only

43. A patient with a nickel allergy should receive a frame made of:

A. Titanium or a hypoallergenic material

B. A nickel-rich alloy

C. An untreated base metal

D. The same alloy with thin plating

44. A trifocal adds a zone, compared with a bifocal, for:

A. The smallest near print

B. Distant road signs

C. Intermediate distances like a monitor

D. Peripheral motion only

45. Which lens enhancement reduces surface reflections and increases light to the eye?

A. A solid tint

B. An anti-reflective coating

C. Edge polishing

D. A scratch coat alone

46. OTC reading glasses are limited because both lenses share:

A. Different powers per eye

B. The same power and a fixed OC spacing

C. A progressive corridor

D. Guaranteed UV protection

47. A rimless drill-mount frame is best fitted with:

A. Polycarbonate or Trivex

B. Crown glass

C. Standard CR-39

D. Untempered glass

48. A gradient tint is:

A. Darker at the top, lighter at the bottom

B. Uniform in density throughout

C. Color-changing in sunlight

D. Blocking only horizontal glare

49. The executive bifocal has a near segment that:

A. Is a small round shape

B. Changes power continuously

C. Is absent entirely

D. Spans the full lens width

50. A dark sunglass lens without UV protection can be harmful because it:

A. Reflects all light away

B. Permanently fixes the Rx

C. Increases impact resistance

D. Dilates the pupil while admitting UV

51. Low vision aids work primarily through:

A. Magnification and contrast enhancement

B. Surgical retinal repair

C. Reversal of the disease

D. Restoration of 20/20 acuity

52. A patient needing the widest sustained near field for drafting is best served by:

A. A small round-segment bifocal

B. An executive-style bifocal

C. A progressive in a shallow frame

D. A pair of OTC readers

53. A patient with a strong plus Rx dislikes magnified-looking eyes. The design that most reduces this is:

A. An aspheric lens

B. A steeper base curve

C. A larger lens blank

D. A thicker center

54. Which frame material is lightweight, strong, and hypoallergenic?

A. Titanium

B. Zyl acetate

C. Nickel silver

D. Untreated base metal

55. A patient sensitive to peripheral color fringing is better served by a material with:

A. The highest possible index

B. The thinnest profile

C. A higher Abbe value

D. The greatest reflection

56. Which mounting-to-edge pairing is correct?

A. Full-rim frame requires a drilled hole

B. Semi-rimless frame requires a groove

C. Rimless frame requires a standard bevel

D. Full-rim frame requires a nylon cord

57. A photochromic lens may underperform when the patient is:

A. Standing in direct sun

B. Walking outdoors on a clear day

C. At high altitude

D. Driving behind a windshield

58. Which is a recognized low vision aid?

A. A routine scratch coat

B. A handheld magnifier

C. A standard distance lens

D. A basic anti-reflective coating

59. A patient needs lenses that darken outdoors and clear indoors automatically. The recommendation is:

A. A solid sunglass tint

B. A polarized lens

C. A photochromic lens

D. A clear lens with AR only

60. A frame offering the most adjustable bridge fit after dispensing is:

A. A fixed saddle-bridge plastic frame

B. A one-piece molded plastic frame

C. A fixed keyhole-bridge plastic frame

D. A metal frame with adjustable nose pads

61. A high-index lens's increased surface reflection is best offset by:

A. An anti-reflective coating

B. A solid tint

C. Edge polishing

D. A photochromic treatment

62. A patient with a –9.00 Rx still has thick edges in a large frame despite high index. Beyond material, recommend:

A. The widest bridge

B. A larger eye size

C. A steeper base curve

D. A smaller, well-centered frame

63. Which is the best description of a solid tint?

A. Darker at the top, lighter at the bottom

B. Color-changing in sunlight

C. Blocking only horizontal glare

D. Uniform density across the lens

64. A lensmeter (focimeter) primarily measures:

A. Lens surface curvature

B. The patient's pupillary distance

C. The back vertex power of a lens

D. The vertex distance to the cornea

65. A lens clock measures a lens's:

A. Back vertex power

B. Pupillary distance

C. Add power for near

D. Surface curvature in diopters

66. The distometer measures:

A. Pupillary distance

B. Vertex distance to the cornea

C. Lens surface curvature

D. Lens size or perimeter

67. A corneal reflex pupillometer measures the patient's:

A. Vertex distance

B. Lens base curve

C. Temple length

D. Pupillary distance

68. When verifying a lens, the back surface faces the lensmeter stop because the standard is:

A. Front vertex power

B. Surface curvature power

C. Equivalent air power

D. Back vertex power

69. Prism in a lens is indicated on the lensmeter by:

A. Displacement of the target from the reticle center

B. A blurred, unfocusable target

C. The axis wheel failing to turn

D. A change in eyepiece magnification

70. A lens clock used on a different-index lens than its calibration will:

A. Be unable to read curvature

B. Read curvature faithfully but give an inexact power value

C. Read a PD value

D. Permanently lose calibration

71. The add power of a multifocal is verified on the lensmeter by:

A. Reading only the near zone

B. Reading only the distance zone

C. Subtracting the distance reading from the near reading

D. Multiplying the two readings

72. A centered lensmeter target with no displacement indicates reading through the:

A. Optical center

B. Thickest edge

C. Segment line

D. Bevel apex

73. A digital measurement system captures all of the following EXCEPT:

A. Pupillary distance

B. Pantoscopic tilt

C. Vertex distance

D. The material's Abbe value

74. Calipers are most appropriately used to measure:

A. Pupillary distance

B. Lens thickness and small linear dimensions

C. Back vertex power

D. UV transmission

75. An automatic lensmeter differs from a manual one in that it:

A. Measures only front vertex power

B. Cannot read cylinder or axis

C. Displays the readings electronically

D. Requires no lens inserted

76. Pad-adjusting pliers are used to:

A. Cut the temple core wire

B. Read the lens base curve

C. Measure the segment height

D. Angle and position the nose pads

77. Plastic (zyl) frames must be prepared for bending by:

A. Cooling in cold water

B. Freezing overnight

C. Warming with a frame heater

D. Bending while fully cold

78. Metal frames, unlike plastic frames, are generally adjusted:

A. After warming with a heater

B. Only when frozen

C. Only after solvent soaking

D. Cold at room temperature

79. Padded nylon-jaw pliers are used to:

A. Apply greater bending force

B. Heat the frame faster

C. Protect the frame finish from marring

D. Measure the frame dimensions

80. A circumference (lens) gauge measures a lens's:

A. Back vertex power

B. Surface curvature

C. Size or perimeter

D. Center thickness

81. A monocular PD is preferred over a binocular PD for patients with:

A. Facial asymmetry

B. A very low prescription

C. A metal-frame preference

D. No prior eyewear

82. A millimeter ruler is most appropriately used to measure:

A. The patient's pupillary distance

B. The total lens power

C. The lens surface curvature

D. The material's dispersion

83. Round-nose pliers are used to:

A. Cut the nylon cord

B. Measure seg height

C. Read the base curve

D. Form curves and bends in metal components

84. Which instrument measures surface curvature in diopters?

A. The distometer

B. The pupillometer

C. The lens clock

D. The circumference gauge

85. Which instrument-to-measurement pairing is correct?

A. Lens clock measures PD

B. Lensmeter measures back vertex power

C. Distometer measures lens thickness

D. Pupillometer measures base curve

86. A finished lens reading sphere power only, with no cylinder, is:

A. A purely spherical lens

B. A spherocylindrical lens

C. A prism-only lens

D. A bifocal lens

87. The instrument used to measure vertex distance is the:

A. Lens clock

B. Pupillometer

C. Circumference gauge

D. Distometer

88. A lensmeter target that stays displaced even at the lens's thickest point indicates:

A. A scratch coating

B. An anti-reflective coating

C. A photochromic treatment

D. Prescribed prism

89. A digital measurement system's position-of-wear data supports which lens technology?

A. Standard stock single vision only

B. OTC readers only

C. Free-form (digital) lenses

D. Untreated glass only

90. Calipers and thickness gauges confirm a lens meets minimum thickness for:

A. Higher Abbe value

B. Automatic tint change

C. Anti-reflective performance

D. Impact resistance and durability

91. A patient reports headaches in new glasses whose power verifies correct. The optician first checks the:

A. PD and optical-center placement

B. Lens tint density

C. Coating brand

D. Frame color

92. A patient says the floor "swims" in new glasses with verified-correct power. The likely cause is a change in the:

A. Lens tint

B. Temple length

C. Base curve from the previous pair

D. Coating type

93. A patient's frame slides down the nose. The optician examines the fitting triangle's:

A. Lens anti-reflective coating

B. Lens base curve only

C. Lens material index

D. Bridge/nose-pad fit and temples

94. A first-time progressive wearer's mild initial peripheral blur is best understood as:

A. A definite power error

B. A coating defect

C. Expected adaptation

D. A frame-material error

95. A lifestyle assessment guides product choice mainly because:

A. Only frame color depends on it

B. The Rx alone dictates everything

C. Working distances and tasks drive selection

D. Activities have no bearing on lenses

96. A patient's bifocal seg intrudes on distance vision. It was set:

A. At the correct lower-lid level

B. Within tolerance properly

C. Too low on the lens

D. Too high relative to the lower lid

97. Double vision in correctly powered glasses most likely indicates:

A. A defective scratch coat

B. A centration error inducing prism

C. An incorrect tint

D. An expired warranty

98. The fundamental purpose of correct centration is to:

A. Place the OC before the pupil and avoid induced prism

B. Increase scratch resistance

C. Darken the lens automatically

D. Raise the Abbe value

99. A patient with good distance and near vision but blurry arm's-length vision needs:

A. A darker near tint

B. A stronger distance lens

C. A larger frame only

D. An intermediate zone (trifocal or progressive)

100. Pantoscopic tilt is the angle at which:

A. The frame curves horizontally around the face

B. The temples bend behind the ears

C. The lower edge of the lens sits closer to the face

D. The lens rotates about its center

101. As pantoscopic tilt increases, the optical center should generally be:

A. Raised toward the top

B. Lowered relative to the pupil

C. Moved temporally

D. Left unchanged

102. For most flat-top bifocal fits, the segment top is set at the:

A. Center of the pupil

B. Lower eyelid margin

C. Upper frame edge

D. Eyebrow line

103. A progressive lens's fitting cross is aligned with the:

A. Lower eyelid margin

B. Top frame edge

C. Temporal canthus

D. Center of the pupil in primary gaze

104. A patient moving to a high-wrap frame with a strong Rx needs lenses that are:

A. Made thicker only

B. Optically compensated for the wrap

C. Left uncoated

D. Cut to a smaller blank

105. Vertex distance most affects effective power when the prescription is:

A. Below 1.00 D

B. Plano in both meridians

C. Purely low-power cylindrical

D. High (around 4.00 D or more)

106. The patient measurement that determines optical-center placement is the:

A. Vertex distance

B. Pupillary distance

C. Temple length

D. Base curve

107. A patient with high anisometropia and reading-level vertical imbalance is commonly helped by a:

A. Slab-off applied to one lens

B. Larger frame eye size

C. Heavier anti-reflective coating

D. Steeper base curve on both lenses

108. A patient's frame sits too far from the eyes on a high-plus Rx, increasing vertex distance. The lens delivers:

A. Exactly the prescribed power

B. Less effective plus power than intended

C. More minus than prescribed

D. No change, since vertex never matters

109. Anisometropia produces vertical imbalance specifically when:

A. Looking straight ahead through the OCs

B. Both eyes are closed

C. The eyes gaze below the OCs to read

D. The frame is perfectly level

110. The first step in troubleshooting a complaint about new eyewear is to:

A. Immediately remake the lenses

B. Blame the prescriber's Rx

C. Replace the frame style

D. Verify the lenses against the prescription

111. A patient needs a frame deep enough for a progressive's three zones. The optician ensures adequate:

A. Temple length

B. Bridge width only

C. Vertical (B) measurement depth

D. Effective-diameter reduction

112. Face-form (wrap) angle refers to the frame's:

A. Vertical tilt of the lens plane

B. Horizontal curvature around the face

C. Distance between the lenses

D. Temple length

113. A patient with a strong minus Rx wanting thin edges should, beyond high index, choose:

A. The largest fashionable frame

B. A smaller, well-centered frame

C. The widest bridge

D. A steeper base curve

114. A patient does extensive night driving. The recommendation most improving night clarity and reducing glare is:

A. A dark solid tint for all conditions

B. A heavily mirrored lens

C. An anti-reflective coating

D. A small frame eye size

115. A patient's lenses make objects appear tilted, though power verifies correct. After verification, the optician checks whether the:

A. Lens index is too high

B. Tint is too dark indoors

C. Coating brand is wrong

D. Frame is sitting level and aligned

116. Under ANSI Z80, a finished lens is acceptable when each parameter is:

A. Within the allowed tolerance for that value

B. Exactly equal to every prescribed number

C. Within any deviation the optician prefers

D. Matched on sphere power only

117. Which agency requires that dress eyeglass lenses be impact resistant?

A. FDA

B. OSHA

C. EPA

D. HIPAA

118. ANSI Z87 governs which category of eyewear?

A. Dress prescription lenses

B. Contact lens solutions

C. Patient privacy records

D. Occupational safety eyewear

119. HIPAA chiefly protects:

A. The impact resistance of lenses

B. The disposal of lab chemicals

C. The privacy of patient health information

D. The workplace safety of employees

120. Under ANSI Z80, axis tolerance becomes tighter as the:

A. Cylinder power increases

B. Lens index decreases

C. Frame eye size increases

D. Vertex distance decreases

121. An optician fitting a patient for arc welding with ordinary dress lenses must:

A. Warn that the eyewear is not occupationally rated

B. Dispense them silently

C. Substitute a darker fashion tint

D. Recommend OTC readers

122. ASTM standards, distinct from ANSI Z87, most directly govern:

A. Dress prescription lens tolerances

B. Sports and recreational protective eyewear

C. Patient privacy records

D. Environmental waste disposal

123. A patient is generally entitled to which of the following regarding their prescription?

A. No access to their own records

B. A copy of their own prescription

C. Only a verbal summary

D. Access only through a third party

124. The duty to warn most directly serves to:

A. Increase the lens Abbe value

B. Reduce the lens edge thickness

C. Inform patients of product limitations and proper use

D. Eliminate the need for safety standards

125. An electronic medical record holding a patient's prescription must comply with:

A. HIPAA privacy and security rules

B. The ANSI Z80 tolerance standard

C. The FDA drop-ball test

D. The EPA waste rule

Answer Key & Full Explanations

1. A — +2.50 D. Power is the reciprocal of focal length in meters: 1 ÷ 0.40 = 2.50 D. Longer focal lengths give weaker powers.

2. B — –4.00 D. The axis is 180, so the cylinder has zero power there and full power 90° away: –3.00 + (–1.00) = –4.00 D in the vertical (090) meridian. This is the two-meridian behavior of a spherocylindrical lens.

3. D — 2.4 prism diopters. Convert 8 mm to 0.8 cm and apply Prentice's rule: $\Delta = 0.8 \times 3.00 = 2.4\Delta$. The millimeter-to-centimeter conversion prevents a tenfold error.

4. C — –1.00 +2.00 x 180. Combine sphere and cylinder (+1.00 – 2.00 = –1.00), reverse the cylinder sign (–2.00 → +2.00), and rotate the axis 90° (090 + 90 = 180). The result is the identical lens in plus-cylinder form.

5. C — Dispersion and chromatic aberration. The Abbe value quantifies a material's dispersion and therefore its chromatic aberration; a lower value means more color fringing. It is unrelated to scratch resistance, UV blocking, or impact resistance.

6. D — 2 mm inward. Frame PD = 52 + 16 = 68 mm; total decentration = 68 – 64 = 4 mm; per lens = 4 ÷ 2 = 2 mm inward. The centers move nasally because the PD is narrower than the frame PD.

7. B — Converges it to a focal point. A plus (convex) lens converges parallel light to a focal point, which corrects hyperopia. This convergence is the defining behavior of a plus lens.

8. D — –3.00 D. Spherical equivalent equals sphere plus half the cylinder: –2.00 + (½ × –2.00) = –2.00 + (–1.00) = –3.00 D. Carrying the cylinder's sign through is essential.

9. A — No prism is prescribed. The major reference point coincides with the optical center only when no prism is prescribed; prescribed prism separates them. This distinction is fundamental to centration.

10. B — 100% of the cylinder. The cylinder axis is at 180, so the meridian 90° away (090) carries the full cylinder power. Cylinder effect grows from 0% at the axis to 100% at 90°.

11. C — Edges. A minus lens is thin at the center and thickest at the edges, with edge thickness growing as minus power increases. This is why strong myopes benefit from smaller frames and higher index.

12. D — 1 inch = 25.4 mm. The standard inch-to-millimeter conversion is 25.4 mm, used to convert imperial measurements to the metric dispensary units. From it any inch-based value can be derived.

13. C — 0.25 meters in front of the eye. The far point of an uncorrected myope is the reciprocal of the power: 1 ÷ 4.00 = 0.25 m. This is why a –4.00 myope sees clearly only at near without correction.

14. B — Falls. Abbe value runs inversely to index of refraction, so as index rises the Abbe value generally falls and chromatic aberration increases. This inverse relationship is the key material trade-off.

15. C — 2.0 prism diopters. Apply Prentice's rule at 1.0 cm: OD = 1.0 × 5.00 = 5.0Δ and OS = 1.0 × 3.00 = 3.0Δ, both base down; subtract: 5.0 – 3.0 = 2.0Δ. The imbalance is the difference between the two eyes' induced prism.

16. A — It has two principal powers in two principal meridians. A spherocylindrical lens combines a sphere and a cylinder, producing two distinct powers in its two principal meridians. This two-meridian behavior underlies transposition.

17. D — Smaller than normal. A minus lens minifies, making the wearer's eyes appear smaller. A plus lens, by contrast, magnifies.

18. C — Meters. The diopter is the reciprocal of focal length in meters, so focal lengths must be converted to meters before computing power. This is the basis of the power definition.

19. C — 4 mm below the OC. From Prentice's rule, $c = \Delta \div F = 2.0 \div 5.00 = 0.4$ cm = 4 mm. Solving for the distance inverts the standard prism calculation.

20. A — Apex. A prism bends light toward its base but displaces the perceived image toward its apex (thin edge). This image-toward-apex behavior is how prism repositions images.

21. D — 90 degrees. Transposition rotates the cylinder axis exactly 90°, adding 90 if the axis is 90 or below and subtracting 90 if above. This keeps the new axis within the 1–180 range.

22. C — Toward the normal. Light entering a denser medium slows and bends toward the normal (the perpendicular to the surface). This bending is the basis of refraction and focusing.

23. D — +8.00 D. Convert 0.125 m and take the reciprocal: $1 \div 0.125 = 8.00$ D. Shorter focal lengths correspond to stronger powers.

24. B — Simple myopic astigmatism. A plano sphere with a minus cylinder places one focal line on the retina and the other in front, defining simple myopic astigmatism. The plano sphere and single minus cylinder are its signature.

25. B — The cornea. The cornea provides about two-thirds of the eye's refracting power, more than the crystalline lens. Its clarity and curvature are critical to vision.

26. C — Color and fine detail in bright light. Cones, concentrated at the macula, provide color and fine detail in bright (photopic) light. Rods, by contrast, handle dim-light and peripheral vision.

27. A — The age-related loss of accommodation. Presbyopia is the progressive stiffening of the crystalline lens that impairs near focus with age, corrected with a plus add. It differs from a clouded lens (cataract) or elevated pressure (glaucoma).

28. B — The peripheral field. Glaucoma characteristically erodes peripheral vision first while central vision is preserved until late. This is the mirror image of macular degeneration.

29. A — Behind the retina. In hyperopia the eye is too weak or short, so relaxed-eye light focuses behind the retina. A plus lens converges the light forward onto the retina.

30. A — Latent and controlled by fusion. A phoria is a latent misalignment held in check by the brain's fusion, revealed only when fusion is interrupted. A tropia, by contrast, is a constant, manifest turn.

31. B — Aniseikonia. Aniseikonia is a difference in the size of the two eyes' retinal images, which interferes with fusion. It can result from anisometropia but is a distinct concept.

32. C — Fluctuating refractive error. Diabetes can cause blood-sugar-related refractive shifts and fluctuating vision, as well as diabetic retinopathy. Recognizing this pattern is a reason to encourage medical follow-up.

33. A — Central field. Macular degeneration damages the central retina, causing central vision loss while peripheral vision is preserved. This is the mirror image of glaucoma.

34. C — The ciliary muscle. The ciliary muscle changes the crystalline lens's shape to focus on near objects, the process of accommodation. Its age-related decline produces presbyopia.

35. D — Thyroid disease. Exophthalmos, the forward protrusion of the eyes, is most strongly associated with thyroid disease such as Graves'. It can affect frame fit and lid closure.

36. B — Dim-light and peripheral vision. Rods are highly light-sensitive and responsible for dim-light and peripheral vision without color. Cones, by contrast, handle color and detail in bright light.

37. B — 180 degrees. In minus-cylinder notation, with-the-rule astigmatism has its cylinder axis near 180° (steeper vertical meridian). This is opposite to against-the-rule.

38. A — A near object. Convergence is the inward rotation of the eyes to maintain single vision on a near target. Divergence is the opposite movement toward distance.

39. B — Polycarbonate. A high-impact sport demands impact-resistant polycarbonate for safety. Thinness, clarity, and economy are secondary.

40. A — Grooved to seat the cord. A semi-rimless nylon-cord mounting requires a groove cut in the lens edge to seat the cord. Each mounting type dictates its own edge treatment.

41. A — A flat horizontal surface like water. Polarized lenses block horizontally oriented reflected glare, such as that off water, snow, and roads. This makes them ideal for outdoor and driving glare.

42. B — Ultraviolet radiation. Most photochromic lenses darken in response to UV exposure and lighten when UV is removed. This is why many darken less behind a windshield.

43. A — Titanium or a hypoallergenic material. A nickel-allergic patient should be fitted with a hypoallergenic material such as titanium. Nickel-containing alloys risk provoking the reaction.

44. C — Intermediate distances like a monitor. The trifocal's middle zone serves arm's-length intermediate distances between distance and near. This is the gap a standard bifocal does not address.

45. B — An anti-reflective coating. An anti-reflective coating reduces surface reflections and increases light transmission to the eye. Its benefit is greatest on high-index lenses.

46. B — The same power and a fixed OC spacing. OTC readers carry identical power in both lenses and a fixed optical-center spacing, limiting them to simple presbyopic near use. They cannot address astigmatism or unequal eyes.

47. A — Polycarbonate or Trivex. Rimless drill-mount lenses are stressed at the holes, so impact-resistant polycarbonate or Trivex prevents cracking. Glass and brittle materials are inappropriate.

48. A — Darker at the top, lighter at the bottom. A gradient tint transitions from darker at the top to lighter at the bottom, unlike a uniform solid tint. This distinguishes it from a solid tint.

49. D — Spans the full lens width. The executive bifocal's near segment extends across the entire lens width, giving the widest near field. Its size also makes it heavier.

50. D — Dilates the pupil while admitting UV. A dark non-UV lens dilates the pupil due to reduced brightness while letting UV reach the eye, which can be worse than no sunglasses. This is why UV protection must be confirmed separately.

51. A — Magnification and contrast enhancement. Low vision aids work primarily through magnification and contrast/glare control to maximize remaining vision. They do not restore acuity or reverse disease.

52. B — An executive-style bifocal. The executive bifocal's full-width near segment gives the widest sustained near field for drafting work. Round segments and shallow progressives offer narrower zones.

53. A — An aspheric lens. An aspheric lens is flatter and reduces magnification, making a high-plus wearer's eyes appear less enlarged. Steeper curves, larger blanks, and thicker centers worsen the effect.

54. A — Titanium. Titanium is lightweight, strong, corrosion resistant, and hypoallergenic, suiting patients with sensitivities. These properties make it a premium frame material.

55. C — A higher Abbe value. A patient sensitive to peripheral color fringing is better served by a higher-Abbe material, which produces less chromatic aberration. The trade-off is a thicker lens for the same power.

56. B — Semi-rimless frame requires a groove. A semi-rimless nylon-cord mounting requires a groove; full-rim uses a bevel and rimless uses drilled holes. This is the correct mounting-to-edge pairing.

57. D — Driving behind a windshield. Most photochromics activate via UV, which a windshield largely blocks, so they darken less while driving. This is a key limitation to disclose.

58. B — A handheld magnifier. A handheld magnifier is a classic low vision aid that enlarges reading material. Routine coatings and standard lenses are not low vision aids.

59. C — A photochromic lens. A photochromic lens darkens outdoors in UV and lightens indoors, automatically adjusting its tint. This light-adaptive behavior is its defining feature.

60. D — A metal frame with adjustable nose pads. Metal frames with adjustable nose pads allow the bridge fit to be fine-tuned after dispensing. Plastic frames have a largely fixed bridge.

61. A — An anti-reflective coating. Because high-index lenses reflect more light, an anti-reflective coating best offsets that increased reflection. It recovers transmission and reduces glare.

62. D — A smaller, well-centered frame. For a very strong minus prescription, reducing the eye size and centering well cuts edge thickness even with high-index material. A large frame keeps edges thick.

63. D — Uniform density across the lens. A solid tint has the same density across the entire lens, unlike a gradient tint that varies top to bottom. Solid tints serve general sun and cosmetic use.

64. C — The back vertex power of a lens. The lensmeter measures back vertex power — sphere, cylinder, axis, add, and prism — and locates the optical center. It is the central instrument for verifying finished lenses.

65. D — Surface curvature in diopters. A lens clock measures the curvature of a lens surface in diopters and is the primary tool for checking base curve. It reads one surface at a time, not total power.

66. B — Vertex distance to the cornea. The distometer measures the vertex distance — the gap from the back of the lens to the cornea. This is used for vertex compensation in higher-powered prescriptions.

67. D — Pupillary distance. A corneal reflex pupillometer measures the patient's PD using the corneal light reflex. PD determines optical-center placement.

68. D — Back vertex power. Spectacle power is specified as back vertex power, so the lens is placed back-surface against the lensmeter stop. Reversing it introduces error in higher powers.

69. A — Displacement of the target from the reticle center. Prism is indicated when the lensmeter target is displaced from the reticle center, with the amount and direction giving its magnitude and base. A centered target indicates the optical center.

70. B — Read curvature faithfully but give an inexact power value. A lens clock is calibrated to one assumed index, so on a different-index lens it measures curvature faithfully but the power reading is not exact. The curvature itself is read accurately.

71. C — Subtracting the distance reading from the near reading. The add power equals the near zone reading minus the distance zone reading, since the add is the additional near plus power. It is obtained by difference, not read directly.

72. A — Optical center. A centered, undisplaced lensmeter target indicates the instrument is reading through the optical center, where no prism is present. Displacement would indicate prism.

73. D — The material's Abbe value. A digital measurement system captures position-of-wear data — PD, pantoscopic tilt, vertex distance, seg height — but not the material's Abbe value, which is a material property. This makes Abbe value the exception.

74. B — Lens thickness and small linear dimensions. Calipers measure lens thickness and small linear dimensions in millimeters. They do not measure power, PD, or UV transmission.

75. C — Displays the readings electronically. An automatic lensmeter displays its readings electronically once the lens is positioned, reducing operator variability. It measures the same back vertex parameters as a manual instrument.

76. D — Angle and position the nose pads. Pad-adjusting pliers grip and angle the nose-pad arms to position the pads. Matching the plier to its task protects both the frame and the fit.

77. C — Warming with a frame heater. Plastic (zyl) frames must be warmed before bending because cold plastic is brittle and can crack. The warmth lets the frame reshape and hold its new form.

78. D — Cold at room temperature. Metal frames are generally adjusted cold, unlike plastic frames which must be warmed first. Knowing which to heat is a practical distinction.

79. C — Protect the frame finish from marring. Padded nylon-jaw pliers grip frame parts without scratching the finish. Metal jaws on cosmetic surfaces would mar the frame.

80. C — Size or perimeter. A circumference (lens) gauge measures a lens's size or perimeter, used in edging and sizing. It does not measure power, curvature, or thickness.

81. A — Facial asymmetry. Monocular PDs measure each eye separately from the bridge center, improving accuracy when the face is asymmetric. This ensures each optical center aligns with its own pupil.

82. A — The patient's pupillary distance. A millimeter ruler measures linear distances such as PD and seg height. It cannot measure power, curvature, or dispersion.

83. D — Form curves and bends in metal components. Round-nose pliers are used to form curves and bends in metal frame parts. Each plier shape serves a specific adjustment task.

84. C — The lens clock. A lens clock measures a lens's surface curvature in diopters and is the primary tool for checking base curve. The other instruments measure vertex distance, PD, or lens size.

85. B — Lensmeter measures back vertex power. The lensmeter measures back vertex power; the other pairings are incorrect. Matching each tool to its true function is the testable skill.

86. A — A purely spherical lens. A lens reading sphere power with no cylinder is purely spherical, having one power in all meridians. A spherocylindrical lens would show a second power and an axis.

87. D — Distometer. The distometer measures vertex distance, the gap from the back of the lens to the cornea, used for compensating high-powered prescriptions. The other instruments measure curvature, PD, or lens size.

88. D — Prescribed prism. A persistently displaced lensmeter target, even at the thickest point, indicates the lens contains prism. Coatings and treatments do not displace the target.

89. C — Free-form (digital) lenses. A digital measurement system's position-of-wear data supports free-form (digital) lenses, which personalize optics to the wearer. Standard stock and OTC lenses do not use this data.

90. D — Impact resistance and durability. Calipers and thickness gauges confirm a lens meets minimum thickness for impact resistance and durability. Adequate thickness is part of the safety requirement.

91. A — PD and optical-center placement. Headaches with correctly verified power suggest a centration error, so the optician checks PD and OC placement, which can induce prism. Centration is verified before blaming the prescription.

92. C — Base curve from the previous pair. A "swim" sensation with correctly verified power often signals a base-curve change from the patient's prior lenses. Matching the previous base curve helps a remake feel familiar.

93. D — Bridge/nose-pad fit and temples. A frame that slides down points to the fitting triangle's support points — the bridge/nose pads and temples. Restoring even three-point support resolves the slipping.

94. C — Expected adaptation. Mild initial peripheral blur in a first-time progressive wearer is normal adaptation to the design, not a power error. Recognizing adaptation prevents an unnecessary remake.

95. C — Working distances and tasks drive selection. A lifestyle assessment matters because the patient's daily working distances and tasks, more than the prescription alone, determine the right lens design. The same Rx can call for different products.

96. D — Too high relative to the lower lid. A bifocal segment that intrudes on distance vision was set too high relative to the lower-lid reference. Correct seg height places the top near the lower lid.

97. B — A centration error inducing prism. Double vision in correctly powered glasses most likely reflects a centration error inducing unwanted prism. Coatings, tints, and warranties do not cause diplopia.

98. A — Place the OC before the pupil and avoid induced prism. Correct centration places the optical center in front of the pupil so no unwanted prism is induced in primary gaze. This is the core purpose of accurate centration.

99. D — An intermediate zone (trifocal or progressive). Good distance and near but blurry arm's-length vision indicates a missing intermediate zone, supplied by a trifocal or progressive. A tint or stronger distance does not address it.

100. C — The lower edge of the lens sits closer to the face. Pantoscopic tilt is the vertical tilt in which the lens's lower edge sits closer to the face than the top. A modest tilt aligns the lens with the downward line of sight.

101. B — Lowered relative to the pupil. As pantoscopic tilt increases, the optical center is lowered (roughly 1 mm per 2° of tilt) to keep the line of sight near the OC. Tilt and OC height are linked.

102. B — Lower eyelid margin. For most flat-top bifocal fits, the segment top is set at the lower eyelid margin so the patient sees over it for distance and into it for near. Setting it too high or low compromises vision.

103. D — Center of the pupil in primary gaze. A progressive lens's fitting cross is aligned with the pupil center in primary gaze so the power zones sit correctly. Fitting it too low places the reading area too far down.

104. B — Optically compensated for the wrap. Moving to a high-wrap frame with a strong prescription requires lenses optically compensated for the wrap to avoid peripheral distortion. Thickness changes and blank size do not address the wrap optics.

105. D — High (around 4.00 D or more). Vertex distance meaningfully affects effective power only in higher prescriptions, around 4.00 D and above. Low powers are not meaningfully affected.

106. B — Pupillary distance. PD determines where each lens's optical center must be placed to align with the pupil. Accurate PD prevents unwanted induced prism.

107. A — Slab-off applied to one lens. Significant vertical imbalance from anisometropia is commonly corrected with a slab-off, which adds prism in the reading portion of one lens. This neutralizes the imbalance in down-gaze.

108. B — Less effective plus power than intended. Increasing the vertex distance on a high-plus lens reduces its effective power at the eye, so the patient receives less plus than intended. This is why vertex matters in strong plus prescriptions.

109. C — The eyes gaze below the OCs to read. Vertical imbalance arises in down-gaze because the eyes look below the optical centers by different amounts in anisometropia, inducing unequal prism. In primary gaze through the OCs no imbalance occurs.

110. D — Verify the lenses against the prescription. The first troubleshooting step is to verify the lenses against the prescription on the lensmeter. Remaking, blaming the Rx, or changing the frame before verifying is premature.

111. C — Vertical (B) measurement depth. A progressive needs adequate vertical (B) depth to fit its distance, intermediate, and near zones. A too-shallow frame cuts off the near area.

112. B — Horizontal curvature around the face. Face-form (wrap) angle is the horizontal curvature of the frame front following the contour of the face. Significant wrap requires lens compensation to avoid distortion.

113. B — A smaller, well-centered frame. Beyond high-index material, a smaller, well-centered frame most effectively reduces edge thickness for a strong minus prescription. A large frame or wide bridge keeps edges thick.

114. C — An anti-reflective coating. An anti-reflective coating reduces glare and improves night-driving clarity by cutting surface reflections. A dark or mirrored lens would reduce useful light at night.

115. D — Frame is sitting level and aligned. Objects appearing tilted with correct power point to frame alignment, which the optician checks after verification. A frame not sitting level can produce a tilted-image complaint.

116. A — Within the allowed tolerance for that value. A finished lens is acceptable under ANSI Z80 when each parameter falls within its allowed tolerance, not when it matches every number exactly. "Within tolerance" is the practical standard.

117. A — FDA. The FDA requires that dress eyeglass lenses be impact resistant, regulating eyewear as a medical device. This is distinct from the ANSI Z87 occupational standard.

118. D — Occupational safety eyewear. ANSI Z87 governs occupational and educational safety eyewear, distinct from ANSI Z80 for dress lenses. It imposes stricter impact and protection requirements.

119. C — The privacy of patient health information. HIPAA protects the privacy and security of a patient's health information, including prescriptions and personal data. It governs how records are stored, accessed, and disclosed.

120. A — Cylinder power increases. ANSI Z80 tightens axis tolerance as cylinder power increases because the same axis deviation produces more visual blur with a stronger cylinder. Weak cylinders are more forgiving.

121. A — Warn that the eyewear is not occupationally rated. The duty to warn requires telling the patient that ordinary dress lenses are not rated for occupational hazards like arc welding. Dispensing them silently would be a safety and liability failure.

122. B — Sports and recreational protective eyewear. ASTM standards most directly govern sports and recreational protective eyewear, distinct from ANSI Z87 (occupational) and Z80 (dress). Matching the standard to the use is the testable skill.

123. B — A copy of their own prescription. Patients are generally entitled to a copy of their own prescription. Withholding it or limiting them to a verbal summary is improper.

124. C — Inform patients of product limitations and proper use. The duty to warn serves to inform patients of the limitations and proper use of their eyewear. It does not alter Abbe value, thickness, or the need for standards.

125. A — HIPAA privacy and security rules. An electronic medical record holding a patient's prescription and identifiers must comply with HIPAA's privacy and security rules. ANSI and FDA standards govern products, not records.