PRACTICE EXAM 6

1. A lens has a focal length of 25 cm. Converting to meters and taking the reciprocal, its power is:

A. +25.0 D

B. +4.00 D

C. +2.50 D

D. +0.40 D

2. A patient looks 9 mm below the optical center of a +5.00 D lens. The induced prism is:

A. 45.0 prism diopters

B. 4.5 prism diopters

C. 0.45 prism diopters

D. 9.0 prism diopters

3. A prescription reads –2.50 +1.75 x 110. Transposed to minus-cylinder form, the new sphere is:

A. –0.75 D

B. +1.75 D

C. –4.25 D

D. –2.50 D

4. The spherical equivalent of +1.50 –3.00 x 045 is:

A. 0.00 D

B. +1.50 D

C. –3.00 D

D. +3.00 D

5. A +3.00 cylinder lies at axis 180. Using $F \times \sin^2\theta$, the cylinder power effective at the 150 meridian (30° from axis) is:

A. 2.60 D

B. 1.50 D

C. 0.75 D

D. 0.00 D

6. A patient reads 10 mm below the OCs with vertical powers OD +5.00 and OS +2.00, both base down. The vertical imbalance is:

A. 7.0 prism diopters

B. 5.0 prism diopters

C. 3.0 prism diopters

D. 2.0 prism diopters

7. A frame marked 54 □ 18 is fitted to a 64 mm PD. The decentration per lens, and direction, is:

A. 8 mm inward per lens

B. 4 mm inward per lens

C. 4 mm outward per lens

D. 8 mm outward per lens

8. A patient's distance Rx is –1.25 and the add is +2.50. The total near power is:

A. –3.75 D

B. +1.25 D

C. +2.50 D

D. +3.75 D

9. A +4.00 D lens induces 2.0Δ of prism at a point a certain distance below the optical center. That distance is:

A. 8.0 mm

B. 0.5 mm

C. 5.0 mm

D. 2.0 mm

10. Using Prentice's rule for a –6.00 D lens at a point 5 mm below the optical center, the induced prism magnitude is:

A. 3.0 prism diopters

B. 30.0 prism diopters

C. 1.2 prism diopters

D. 0.83 prism diopters

11. A prescription reads +2.00 –1.50 x 090. The power in the horizontal (180) meridian is:

A. +2.00 D

B. +0.50 D

C. –1.50 D

D. +3.50 D

12. 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

13. A +2.00 cylinder is effective at what value at the meridian exactly 45° from its axis?

A. 0.00 D

B. 2.00 D

C. 1.41 D

D. 1.00 D

14. A spectacle lens is +8.00 D at a 12 mm vertex. Refit as a contact lens (zero vertex, 12 mm closer), using F/(1 – dF), the power becomes approximately:

A. +7.00 D

B. +8.00 D

C. +8.85 D

D. +9.50 D

15. A patient looks 6 mm below the OC of a +2.50 D lens. The induced prism, with direction, is:

A. 1.5Δ base down

B. 15.0Δ base down

C. 0.15Δ base up

D. 2.5Δ base up

16. Transpose –3.00 +2.00 x 180 to minus-cylinder form. The result is:

A. –1.00 –2.00 x 090

B. –3.00 –2.00 x 180

C. +1.00 –2.00 x 090

D. –1.00 +2.00 x 090

17. A frame marked 50 □ 20 is fitted to a 66 mm PD. The decentration per lens is:

A. 14 mm inward

B. 6 mm outward

C. 3 mm outward

D. 2 mm inward

18. A lens of power –3.00 D has a focal length of:

A. 0.333 meters

B. 3.0 meters

C. 0.30 meters

D. 30 meters

19. A patient reads 8 mm below the OCs with vertical powers OD +3.00 and OS +1.50, both base down. The vertical imbalance is:

A. 1.2 prism diopters

B. 2.4 prism diopters

C. 0.5 prism diopters

D. 3.6 prism diopters

20. The spherical equivalent of –4.00 –1.00 x 180 is:

A. –4.00 D

B. –4.50 D

C. –5.00 D

D. –3.50 D

21. A –10.00 D spectacle lens at 12 mm vertex is refit as a contact lens (12 mm closer). Using F/(1 – dF), the contact lens power is approximately:

A. –10.00 D

B. –12.00 D

C. –8.93 D

D. –11.40 D

22. A patient looks 4 mm below the OC of a +7.50 D lens. The induced prism is:

A. 3.0 prism diopters

B. 30.0 prism diopters

C. 0.3 prism diopters

D. 7.5 prism diopters

23. A +1.00 cylinder lies at axis 090. The cylinder power effective at the 090 meridian (the axis) is:

A. 1.00 D

B. 0.00 D

C. 0.50 D

D. 0.25 D

24. A lens whose focal length is 0.20 m has a power of:

A. +5.00 D

B. +2.00 D

C. +0.20 D

D. +20.0 D

25. A prescription reads OD +2.00 –1.00 x 090. The power in the vertical (090) meridian is:

A. +1.00 D

B. –1.00 D

C. +2.00 D

D. +3.00 D

26. A patient's Rx is plano –2.50 x 180. By focal-line position, this is:

A. Compound myopic astigmatism

B. Simple myopic astigmatism

C. Simple hyperopic astigmatism

D. Mixed astigmatism

27. Light focuses in front of the retina in which refractive error?

A. Hyperopia

B. Myopia

C. Emmetropia

D. Presbyopia

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

A. The cornea

B. The crystalline lens

C. The vitreous humor

D. The aqueous humor

29. Presbyopia results from the age-related stiffening of which structure?

A. The crystalline lens

B. The cornea

C. The sclera

D. The iris

30. Cones, concentrated at the macula, are responsible for:

A. Dim-light peripheral vision

B. Tear production

C. Aqueous humor drainage

D. Color and fine detail in bright light

31. Which condition produces painless, gradual peripheral vision loss with optic nerve damage?

A. Cataract

B. Macular degeneration

C. Glaucoma

D. Amblyopia

32. A phoria is best described as:

A. A latent misalignment controlled by fusion

B. A constant, manifest eye turn

C. A clouding of the lens

D. A localized blind spot

33. Which term means unequal refractive error between the two eyes?

A. Aniseikonia

B. Emmetropia

C. Presbyopia

D. Anisometropia

34. Macular degeneration characteristically affects which part of the field?

A. The peripheral field

B. The upper field only

C. The central field

D. The lower field only

35. Exophthalmos is most strongly associated with:

A. Diabetes

B. Hypertension

C. Rheumatoid arthritis

D. Thyroid disease

36. Convergence is the eyes' inward rotation that occurs when viewing:

A. A distant object

B. A near object

C. The far periphery

D. With eyes closed

37. Which photoreceptors handle dim-light and peripheral vision?

A. Rods

B. Cones

C. Bipolar cells

D. Ganglion cells

38. Diabetes can affect a patient's vision by causing:

A. A permanently fixed refractive error

B. Immunity to cataract

C. Fluctuating, shifting refractive error

D. Improved distance acuity

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

A. Polycarbonate for impact resistance

B. Crown glass for clarity

C. Ultra-high index for thinness

D. Standard CR-39 for economy

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

A. Beveled for full-rim mounting

B. Grooved to seat the cord

C. Drilled with mounting holes

D. Left flat and unfinished

41. A polarized lens most effectively reduces glare reflected from:

A. A vertical wall

B. Overhead lighting

C. A flat horizontal surface like water

D. The wearer's lashes

42. A photochromic lens darkens primarily in response to:

A. Infrared heat

B. Body temperature

C. Visible blue light only

D. Ultraviolet radiation

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

A. A nickel-rich alloy

B. Titanium or a hypoallergenic material

C. An untreated base metal

D. The same alloy with thin plating

44. A trifocal adds a zone for which distance, compared with a bifocal?

A. The smallest near print

B. Distant road signs

C. Intermediate, 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. Edge polishing

C. A scratch coat alone

D. An anti-reflective coating

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

A. The same power and a fixed OC spacing

B. Different powers per eye

C. A progressive corridor

D. Guaranteed UV protection

47. A rimless drill-mount frame is best fitted with which material?

A. Crown glass

B. Standard CR-39

C. Untempered glass

D. Polycarbonate or Trivex

48. Which describes a gradient tint?

A. Uniform density throughout

B. Color-changing in sunlight

C. Darker at the top, lighter at the bottom

D. Blocking only horizontal glare

49. The executive bifocal is characterized by a near segment that:

A. Is a small round shape

B. Spans the full lens width

C. Changes power continuously

D. Is absent entirely

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

A. Dilates the pupil while admitting UV

B. Reflects all light away

C. Permanently fixes the Rx

D. Increases impact resistance

51. Low vision aids work primarily through:

A. Surgical retinal repair

B. Magnification and contrast enhancement

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. An executive-style bifocal

B. A small round-segment bifocal

C. A progressive in a shallow frame

D. A pair of OTC readers

53. A patient with a strong plus Rx dislikes how magnified their eyes appear. 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. Zyl acetate

B. Nickel silver

C. Titanium

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. Semi-rimless frame requires a groove

B. Full-rim frame requires a drilled hole

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. Driving behind a windshield

C. Walking outdoors on a clear day

D. At high altitude

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. Polycarbonate is notable for all of the following EXCEPT:

A. High impact resistance

B. Inherent UV blocking

C. Light weight

D. The highest Abbe value among common materials

60. 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

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

A. A fixed saddle-bridge plastic frame

B. A metal frame with adjustable nose pads

C. A one-piece molded plastic frame

D. A fixed keyhole-bridge plastic frame

62. 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. Effective-diameter reduction

D. Vertical (B) measurement depth

63. Which best describes 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 high-index lens's increased reflection is best offset by:

A. A solid tint

B. Edge polishing

C. An anti-reflective coating

D. A photochromic treatment

65. 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

66. 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

67. A lens clock measures a lens's:

A. Surface curvature in diopters

B. Back vertex power

C. Pupillary distance

D. Add power for near

68. The distometer measures:

A. Pupillary distance

B. Vertex distance to the cornea

C. Lens surface curvature

D. Lens size or perimeter

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

A. Pupillary distance

B. Vertex distance

C. Lens base curve

D. Temple length

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

A. Front vertex power

B. Back vertex power

C. Surface curvature power

D. Equivalent air power

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

A. A blurred, unfocusable target

B. The axis wheel failing to turn

C. Displacement of the target from the reticle center

D. A change in eyepiece magnification

72. A lens clock used on a lens of a different index than its calibration will:

A. Be unable to read curvature

B. Permanently lose calibration

C. Read a PD value

D. Read curvature faithfully but give an inexact power value

73. The add power of a multifocal is verified 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

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

A. The material's Abbe value

B. Pupillary distance

C. Pantoscopic tilt

D. Vertex distance

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

A. Thickest edge

B. Segment line

C. Bevel apex

D. Optical center

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

A. Back vertex power

B. Surface curvature

C. Size or perimeter

D. Center thickness

77. Calipers are most appropriately used to measure:

A. Lens thickness and small linear dimensions

B. Back vertex power

C. Pupillary distance

D. UV transmission

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

A. Measures only front vertex power

B. Cannot read cylinder or axis

C. Requires no lens inserted

D. Displays the readings electronically

79. Pad-adjusting pliers are used to:

A. Cut the temple core wire

B. Angle and position the nose pads

C. Read the lens base curve

D. Measure the segment height

80. 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

81. 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

82. Padded nylon-jaw pliers are used to:

A. Apply greater bending force

B. Protect the frame finish from marring

C. Heat the frame faster

D. Measure the frame dimensions

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

A. A very low prescription

B. A metal-frame preference

C. No prior eyewear

D. Facial asymmetry

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

A. Total lens power

B. Pupillary distance

C. Surface curvature

D. Material dispersion

85. Round-nose pliers are used to:

A. Cut the nylon cord

B. Measure seg height

C. Form curves in metal components

D. Read the base curve

86. Which instrument measures surface curvature in diopters?

A. The distometer

B. The pupillometer

C. The circumference gauge

D. The lens clock

87. 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

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

A. A spherocylindrical lens

B. A purely spherical lens

C. A prism-only lens

D. A bifocal lens

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

A. Lens clock

B. Pupillometer

C. Circumference gauge

D. Distometer

91. The add power is computed on the lensmeter as:

A. The distance reading alone

B. The near reading alone

C. The product of both readings

D. The near reading minus the distance reading

92. A lens clock placed on a high-index lens should be read with caution because it is:

A. Calibrated for one specific index

B. Unable to detect curvature

C. A PD-measuring device

D. A prism-only device

93. A digital measurement system supports which lens technology with its position-of-wear data?

A. Free-form (digital) lenses

B. Standard stock single vision only

C. Untreated glass lenses only

D. OTC readers only

94. A lensmeter measures all of the following EXCEPT:

A. Sphere power

B. Cylinder and axis

C. The frame temple length

D. Prism

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

A. Higher Abbe value

B. Automatic tint change

C. Impact resistance and durability

D. Anti-reflective performance

96. The fitting triangle's three points of support are:

A. The two lenses and the bridge

B. The nose and the two ears

C. The forehead and both cheeks

D. The two temples and the chin

97. 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

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

A. Lowered relative to the pupil

B. Raised toward the top

C. Moved temporally

D. Left unchanged

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

A. Center of the pupil

B. Upper frame edge

C. Eyebrow line

D. Lower eyelid margin

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

A. Center of the pupil in primary gaze

B. Lower eyelid margin

C. Top frame edge

D. Temporal canthus

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

A. Lens tint density

B. PD and optical-center placement

C. Coating brand

D. Frame color

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

A. Base curve from the previous pair

B. Lens tint

C. Temple length

D. Coating type

103. A patient's frame slides down the nose. The optician examines which support of the fitting triangle?

A. The lens anti-reflective coating

B. The bridge or nose-pad fit and temples

C. The lens base curve only

D. The lens material index

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

A. A definite power error

B. A coating defect

C. A frame-material error

D. Expected adaptation

105. A lifestyle assessment guides product choice mainly because:

A. Working distances and tasks drive selection

B. Only frame color depends on it

C. The Rx alone dictates everything

D. Activities have no bearing on lenses

106. 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

107. 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

108. The fundamental purpose of correct centration is to:

A. Increase scratch resistance

B. Darken the lens automatically

C. Raise the Abbe value

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

109. 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. An intermediate zone (trifocal or progressive)

D. A larger frame only

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

A. Made thicker only

B. Left uncoated

C. Cut to a smaller blank

D. Optically compensated for the wrap

111. 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

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

A. Below 1.00 D

B. High (around 4.00 D or more)

C. Plano in both meridians

D. Purely cylindrical at low power

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

A. Pupillary distance

B. Vertex distance

C. Temple length

D. Base curve

114. 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. More minus than prescribed

C. Less effective plus power than intended

D. No change, since vertex never matters

115. A patient with anisometropia experiences vertical imbalance specifically when:

A. The eyes gaze below the OCs to read

B. Looking straight ahead through the OCs

C. Both eyes are closed

D. The frame is perfectly level

116. 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

117. 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

118. A patient's reading add must be reachable in down-gaze. A flat-top seg's top is, for most fits, set at the:

A. Eyebrow line

B. Upper frame edge

C. Center of the pupil

D. Lower eyelid margin

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

A. Larger frame eye size

B. Heavier anti-reflective coating

C. Slab-off applied to one lens

D. Steeper base curve on both lenses

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

A. Frame is sitting level and aligned

B. Lens index is too high

C. Tint is too dark indoors

D. Coating brand is wrong

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

A. Exactly equal to every prescribed number

B. Within any deviation the optician prefers

C. Within the allowed tolerance for that value

D. Matched on sphere power only

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

A. OSHA

B. EPA

C. HIPAA

D. FDA

123. ANSI Z87 governs which category of eyewear?

A. Dress prescription lenses

B. Contact lens solutions

C. Occupational safety eyewear

D. Patient privacy records

124. HIPAA chiefly protects:

A. The impact resistance of lenses

B. The disposal of lab chemicals

C. The workplace safety of employees

D. The privacy of patient health information

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

A. Lens index decreases

B. Frame eye size increases

C. Vertex distance decreases

D. Cylinder power increases

Answer Key & Full Explanations

1. B — +4.00 D. Convert 25 cm to 0.25 m and take the reciprocal: 1 ÷ 0.25 = 4.00 D. The diopter is defined per meter, so conversion precedes the reciprocal.

2. B — 4.5 prism diopters. Convert 9 mm to 0.9 cm and apply Prentice's rule: Δ = 0.9 × 5.00 = 4.5Δ. The millimeter-to-centimeter conversion prevents a tenfold error.

3. A — –0.75 D. Combine sphere and cylinder algebraically: –2.50 + (+1.75) = –0.75 D. This new sphere is the first transposition step before flipping the cylinder sign and rotating the axis.

4. A — 0.00 D. Spherical equivalent equals sphere plus half the cylinder: +1.50 + (½ × –3.00) = +1.50 + (–1.50) = 0.00 D. Carrying the cylinder's sign through is essential.

5. C — 0.75 D. Using F × sin²θ with θ = 30°: sin 30° = 0.5, squared = 0.25, so 3.00 × 0.25 = 0.75 D. The angle is measured from the axis.

6. C — 3.0 prism diopters. Apply Prentice's rule at 1.0 cm: OD = 1.0 × 5.00 = 5.0Δ and OS = 1.0 × 2.00 = 2.0Δ, both base down; subtract: 5.0 – 2.0 = 3.0Δ. The imbalance is the difference between the two eyes' induced prism.

7. B — 4 mm inward per lens. Frame PD = 54 + 18 = 72 mm; total decentration = 72 – 64 = 8 mm; per lens = 8 ÷ 2 = 4 mm inward. The optical centers move nasally because the PD is narrower than the frame PD.

8. B — +1.25 D. Near power equals distance sphere combined with the add: –1.25 + 2.50 = +1.25 D. The add is additional plus power layered on the distance prescription.

9. C — 5.0 mm. From Prentice's rule, c = Δ ÷ F = 2.0 ÷ 4.00 = 0.5 cm = 5 mm. Solving for the distance inverts the standard prism calculation.

10. A — 3.0 prism diopters. Convert 5 mm to 0.5 cm and apply Prentice's rule: Δ = 0.5 × 6.00 = 3.0Δ. The lens power magnitude is used for the prism amount regardless of sign.

11. A — +2.00 D. The axis is 090, marking the meridian of zero cylinder power, so the horizontal (180) meridian carries only the +2.00 sphere. The cylinder's full power acts 90° away in the vertical meridian.

12. D — +8.00 D. Convert 0.125 m and take the reciprocal: 1 ÷ 0.125 = 8.00 D. Shorter focal lengths correspond to stronger powers.

13. D — 1.00 D. At 45° from the axis, $\sin^2 45° = 0.5$, so half the cylinder is effective: 2.00 × 0.5 = 1.00 D. Cylinder effect runs from 0% at the axis to 100% at 90°.

14. C — +8.85 D. A plus lens moved 12 mm closer to the eye becomes effectively stronger, so more plus is needed. Using $F_c = F_s / (1 - d \cdot F_s)$ with d = 0.012 m: 8.00 / (1 − 0.096) = 8.00 / 0.904 = +8.85 D. Vertex compensation is significant at this power.

15. A — 1.5Δ base down. Convert 6 mm to 0.6 cm: Δ = 0.6 × 2.50 = 1.5Δ; a plus lens has its base toward the optical center, and viewing below the OC gives base down. Both the magnitude and the base direction must be stated.

16. A — –1.00 –2.00 x 090. Combine sphere and cylinder (–3.00 + 2.00 = –1.00), reverse the cylinder sign (+2.00 → –2.00), and rotate the axis 90° (180 – 90 = 090). The result is the identical lens in minus-cylinder form.

17. D — 2 mm inward. Frame PD = 50 + 20 = 70 mm; total decentration = 70 – 66 = 4 mm; per lens = 4 ÷ 2 = 2 mm inward. The centers move nasally because the PD is narrower than the frame PD.

18. A — 0.333 meters. Focal length is the reciprocal of power: 1 ÷ 3.00 = 0.333 m. The magnitude is used; the minus sign indicates a diverging lens.

19. A — 1.2 prism diopters. Apply Prentice's rule at 0.8 cm: OD = 0.8 × 3.00 = 2.4Δ and OS = 0.8 × 1.50 = 1.2Δ, both base down; subtract: 2.4 – 1.2 = 1.2Δ. The imbalance is the difference between the two eyes' induced prism.

20. B — –4.50 D. Spherical equivalent equals sphere plus half the cylinder: –4.00 + (½ × –1.00) = –4.00 + (–0.50) = –4.50 D. Carrying the cylinder's sign through is essential.

21. C — –8.93 D. Moving a minus lens closer (contact lens) makes it effectively weaker, so less minus is needed; using F/(1 – dF) with d = –0.012 m gives –10.00 / (1 – (–0.012 × –10.00)) = –10.00 / 1.12 ≈ –8.93 D. Vertex compensation matters at this power.

22. A — 3.0 prism diopters. Convert 4 mm to 0.4 cm and apply Prentice's rule: Δ = 0.4 × 7.50 = 3.0Δ. The millimeter-to-centimeter conversion is the critical step.

23. B — 0.00 D. The cylinder axis is at 090, and at the axis meridian itself no cylinder power acts. The full cylinder is effective 90° away.

24. A — +5.00 D. Power is the reciprocal of focal length in meters: 1 ÷ 0.20 = 5.00 D. Shorter focal lengths give stronger powers.

25. C — +2.00 D. The axis is 090, marking the meridian of zero cylinder power, so the vertical (090) meridian carries only the +2.00 sphere. The cylinder's full power acts 90° away.

26. 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.

27. B — Myopia. In myopia the eye is too powerful or too long, focusing parallel light in front of the retina. A minus lens corrects it by moving the focus back onto the retina.

28. A — 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.

29. A — The crystalline lens. Presbyopia results from age-related stiffening of the crystalline lens, which impairs near focus. It is corrected with a plus add.

30. D — 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.

31. C — Glaucoma. Glaucoma produces painless, gradual peripheral vision loss with optic nerve damage, often with elevated pressure. Its symptom-free progression is why IOP screening matters.

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

33. D — Anisometropia. Anisometropia is a difference in refractive error between the two eyes. It can cause vertical imbalance in down-gaze and aniseikonia.

34. C — The central field. Macular degeneration damages the central retina, causing central vision loss while peripheral vision is preserved. This is the mirror image of glaucoma.

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 — 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.

37. A — Rods. Rods are highly light-sensitive and handle dim-light and peripheral vision without color. Cones, by contrast, provide color and detail in bright light.

38. C — Fluctuating, shifting 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.

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

40. B — 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. C — 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. D — 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. B — 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, 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. D — 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. A — 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. D — 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. C — 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. B — 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. A — 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. B — 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. A — An executive-style bifocal. The executive bifocal's full-width near segment gives the widest 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. C — 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. A — 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. Matching mounting to edge treatment is essential.

57. B — 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. D — The highest Abbe value among common materials. Polycarbonate has a relatively low Abbe value (~30), so this is NOT one of its properties; it is impact resistant, UV-blocking, and lightweight. The low Abbe value is the trade-off for its safety advantages.

60. 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.

61. B — 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.

62. D — 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.

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 — 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.

65. 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.

66. 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.

67. A — 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.

68. 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.

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

70. B — 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.

71. C — 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.

72. D — 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.

73. 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.

74. A — 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.

75. D — 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.

76. 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.

77. A — 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.

78. D — 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.

79. B — 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.

80. 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.

81. 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.

82. B — 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.

83. D — 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.

84. B — Pupillary distance. A millimeter ruler measures linear distances such as PD and seg height. It cannot measure power, curvature, or dispersion.

85. C — Form curves 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.

86. D — 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.

87. 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.

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. B — 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.

90. 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.

91. D — The near reading minus the distance 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.

92. A — Calibrated for one specific index. A lens clock is calibrated to one assumed index, so on a high-index lens it measures curvature faithfully but the power reading needs caution. The curvature itself is read accurately.

93. A — 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.

94. C — The frame temple length. A lensmeter measures sphere, cylinder, axis, add, and prism — but not the frame temple length, a frame dimension. This makes temple length the exception.

95. C — 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.

96. B — The nose and the two ears. The fitting triangle's three points of support are the nose (bridge or pads) and the two ears (temples). Even weight distribution across these produces a comfortable, stable fit.

97. 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.

98. A — 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.

99. D — 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.

100. A — 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.

101. B — 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.

102. A — 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.

103. B — The bridge or 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.

104. D — 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.

105. A — 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.

106. 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.

107. 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.

108. D — 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.

109. C — 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.

110. D — 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.

111. 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.

112. B — 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.

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

114. C — 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.

115. A — 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.

116. 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.

117. 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.

118. D — Lower eyelid margin. For most flat-top bifocal fits, the segment top is set at the lower eyelid margin so the near zone is reachable in down-gaze. Setting it too high or low compromises vision.

119. C — 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.

120. A — 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.

121. C — 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.

122. D — 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.

123. C — 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.

124. D — 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.

125. D — Cylinder power increases. ANSI Z80 tightens axis tolerance as cylinder power increases because axis error produces more blur with a stronger cylinder. Weak cylinders are more forgiving.