Review Questions

Ophthalmic Optics

A. Physical Characteristics

1. You measure the base curve of a polycarbonate spectacle lens with a lens clock calibrated for n = 1.53. The lens clock reads +4.07 DS. Which is TRUE:

    A. The refracting power of the surface is greater than +4.07 DS
    B. The refracting power of the surface is less than +4.07 DS
    C. The refracting power of the surface is +4.07 DS

2. A round spectacle lens has a power of -1.00 -3.00 x 090. The lens is decentered in by 3 mm. Which edge is the thickest:

    A. Top
    B. Nasal
    C. Temporal
    D. Bottom

3. Which of the following is NOT true regarding the lens clock:

    A. It can be used to determine sagittal depth
    B. It typically assumes an index of 1.53
    C. It can be used to determine cylindrical power
    D. All of these are true

4. Tilting a lens induces oblique astigmatism along the line of sight:

    A. True
    B. False

5. Which best describes the relationship between the index of refraction of an ophthalmic lens and its chromatic aberration:

    A. In general, chromatic aberration increases as index of refraction increases
    B. In general, chromatic aberration decreases as index of refraction increases
    C. There is not a consistent relationship between chromatic aberration and index of refraction

6. Which of the following will not lead to an increase in center thickness for a plus powered spectacle lens:

    A. An increase in edge thickness
    B. An increase in lens power
    C. An increase in base curve power
    D. An increase in index of refraction

B. Optical Characteristics

1. Which of the following can provide front vertex power (more than one may be correct):

    A. Lensometer
    B. Hand Neutralization
    C. Lens Clock

2. Corrected curve design is specifically concerned with:

    A. Reduction of lens thickness
    B. Reduction of lens aberrations
    C. Reduction of lens reflections
    D. All of the above

3. Which of the following is not associated with an increase in pantoscopic tilt for a spherical hyperopic presbyopic spectacle lens:

    A. In increase in effective sphere power
    B. The introduction of plus cylinder power axis 180
    C. An effective increase in bifocal segment height
    D. All of the above

4. Your 40 year old patient's current spectacle correction is -8.00DS, OU. They report that their distance vision is clear with the Rx. However, their vision is slightly blurry at a comfortable reading distance, and this can be improved by moving the lenses farther from their eyes. You should conclude:

    A. They are under-corrected for distance
    B. They are over-corrected for distance
    C. They are becoming presbyopic
    D. They are malingering

5. The spectacle magnification of a +6.00DS lens can be reduced by which of the following:

    A. Choose a flatter base curve
    B. Choose a lens material with higher index
    C. Reduce the vertex distance of the lens
    D. All of the above

6. Which is NOT true regarding an anti-reflective coating for a spectacle lens:

    A. It works on the principal of interference
    B. The index of the coating must satisfy the path condition
    C. The index is always lower than the index of the lens
    D. The path difference is an odd number of half wavelengths

7. What is the optical thickness of an ideal single layer AR coating designed to minimize reflections from a spectacle lens at 600nm:

    A. 150nm
    B. 300nm
    C. 400nm
    D. 600nm

C. Ophthalmic Prism

1. How much displacement is created for an object 50 cm away for a 5^{Δ} prism:

   A. 1.0 cm
   B. 2.5 cm
   C. 5.0 cm
   D. 10.0 cm

2. Clinically, prisms are prescribed using the orientation of the prism relative to:

   A. Base – Apex prism line
   B. Base
   C. Apex
   D. All of these

3. What is the power of a prism that displaces an object 10 cm at a distance of 80 cm:

   A. 8^{Δ}
   B. 10^{Δ}
   C. 12.5^{Δ}
   D. 20^{Δ}

4. An anisometropic patient (+5.00 DS (OD), +2.00 DS (OS)) is reading 8 mm below the distance optical centers of their lenses. Which is correct:

   A. A left hypophoria is induced
   B. The deviation can be neutralized with 2.4^{Δ} base down OD
   C. Slab off (if utilized) would be applied to the left lens
   D. All of the above are correct

5. With your patient looking 10 mm below the optical centers of their distance correction, you observe a right hyperphoria during cover test. If they are orthophoric in primary gaze, which of these is their spectacle Rx:

   A. R: +2.50DS / L: +3.50DS
   B. R: -1.00DS / L: +1.00DS
   C. R: -3.50DS / L: -2.50DS
   D. R: -1.25DS / L: -3.25 DS

6. A hypodeviation induced for a presbyopic patient reading with an anisometropic spectacle correction can be reduced by using:

   A. Single vision reading Rx
   B. Lens decentration
   C. Slab off prism
   D. All of the above

7. What is the induced vertical deviation for a patient reading 1 cm below the optical centers of the following Rx:

   R: +5.00 -2.00 x 180
   L: -1.00 DS

   A. 1^{Δ} Rt Hyper
   B. 2^{Δ} Lt Hyper
   C. 3^{Δ} Lt Hyper
   D. 4^{Δ} Rt Hyper

8. When does the bifocal segment not contribute to the net vertical imbalance in an anisometropic spectacle Rx:

   A. When dissimilar segments are prescribed
   B. When unequal segment heights are prescribed
   C. When compensated segments are prescribed
   D. When segments are of equal powers and height

9. To avoid inducing prism in an Rx when the patient's PD is larger than the frame PD the lenses must be decentered:

   A. In for myopia, out for hyperopia
   B. Out for myopia, in for hyperopia
   C. Out for both myopia and hyperopia
   D. In for both myopia and hyperopia

10. Your patient looks 5 mm to the right of the optical center of their right lens. If an object 1.5 m away moves 4.5 cm to the left, what is the power of the horizontal meridian:

    A. -3.00 D
    B. -6.00 D
    C. +3.00 D
    D. +6.00 D

11. Your myopic patient is reading (at near) with their distance spectacle Rx. If the patient is ortho at near (w/Rx) this will require:

    A. An increase in negative fusional vergence
    B. A decrease in negative fusional vergence
    C. An increase in positive fusional vergence
    D. A decrease in positive fusional vergence

12. Your patient (near PD = 58) is wearing +2.00 DS, OU spectacles at near. If the lenses are centered in the frame and the frame PD is 63, how much prism is induced by the lenses:

    A. 0.5^{Δ} base out
    B. 1.0^{Δ} base out
    C. 2.0^{Δ} base out
    D. 5.0^{Δ} base out

13. A person is wearing a pair of OTC reading glasses with a frame PD of 64. Assuming the lenses are centered within the frame, what effect will the lenses have on the fusional vergence demand if the person is ortho and has a near PD of 60 mm:

    A. An increase in positive fusional vergence
    B. A decrease in positive fusional vergence
    C. An increase in negative fusional vergence
    D. A decrease in negative fusional vergence

D. Multifocal Lenses

1. Which of the following is TRUE:

    A. Near Power – Distance Power = Near Rx
    B. Add – Distance Power = Near Power
    C. Distance Power + Near Power = Near Rx
    D. Near Power – Distance Power = Add

2. Which bifocal segment type produces no image jump at the segment line:

    A. Round 22
    B. Flat Top 28
    C. Executive
    D. All of these produce image jump

3. A patient has the following bifocal Rx:
    -0.50 -0.50 x 180
    -0.50 -0.50 x 180
    Add: +1.75

    What is the appropriate Rx for reading only spectacle lenses:

    A. +1.75 DS, OU
    B. +1.75 -0.50 x 180, OU
    C. +1.25 DS, OU
    D. +1.25 -0.50 x 180, OU

4. A 42 year old patient wearing +6.00 DS, OU single vision lenses for distance is having symptoms of presbyopia. Which of the following is likely to happen if the patient switches to a single vision contact lens correction for distance:

    A. A reduction in accommodative demand
    B. An increase in accommodative demand
    C. No change in accommodative demand

5. A patient requires 2^{Δ} base in prism at near only. The prism should be split equally between lenses. If they are wearing a +2.00 D bifocal segment (inset properly for near PD) what change to segment inset will produce the desired prism:

    A. 2.5 mm additional inset per lens
    B. 5 mm additional inset per lens
    C. 2.5 mm outset per lens
    D. 5 mm outset per lens

6. A patient has the following Rx:
   R: -2.00 DS, 0.50$^{\Delta}$ BO (near only)
   L: -2.00 DS, 0.50$^{\Delta}$ BO (near only)
   Add: +2.50 D
   PD: 64/60
   Prism to be created by decentering segments

   What is the segment inset (per segment):

   A. 1.0 mm inset
   B. 2.0 mm inset
   C. 0
   D. 1.0 mm outset
   E. 2.0 mm outset

7. On a progressive addition spectacle lens the major reference point is the same as the:

   A. Distance reference point
   B. Near reference point
   C. Prism reference point
   D. Fitting cross

8. For a typical patient (no prism in Rx) the total inset of a bifocal lens prescription is:

   A. Frame PD/2 – Near PD /2
   B. Distance PD – Near PD
   C. Frame PD – Distance PD
   D. Frame PD/2 – Distance PD/2

E. Anisometropia / Aniseikonia

1. Which will not help reduce potential for aniseikonic symptoms when correcting a hyperopic anisometropic patient:

   A. Frame with short vertex distance
   B. Frame with a small eyesize
   C. High index lenses
   D. Contact Lenses
   E. All of the above will help reduce the potential for symptoms

2. How much slab off prism is required to eliminate the vertical prism induced in downgaze if the reading level is 10mm below the distance optical centers:
   R: -2.50 DS
   L: +2.50 DS

   A. 2.5$^{\Delta}$ base up OD
   B. 2.5$^{\Delta}$ base down OS
   C. 5.0$^{\Delta}$ base up OD
   D. 5.0$^{\Delta}$ base down OS

3. Which of the following changes will help decrease the aniseikonic symptoms for a patient wearing the following spectacle Rx (more than one may be correct):

   R: +4.00DS
   L: +6.00DS

   A. Flatten the base curve of the right lens
   B. Flatten the base curve of the left lens
   C. Increase the center thickness of the right lens
   D. Increase the center thickness of the left lens

4. Which of the following does not influence the shape factor in the determination of spectacle magnification:

   A. Base Curve
   B. Back Vertex Power
   C. Center Thickness
   D. Index of Refraction

5. Which is NOT a reasonable solution for addressing low amounts of aniseikonia induced by spectacle lens wear:

   A. The addition of lateral prism to each lens
   B. Contact Lens correction
   C. Equal base curves and equal center thicknesses
   D. All of these are reasonable solutions

6. Your patient is wearing a recently prescribed spectacle prescription (see parameters below). They are complaining of discomfort and headaches when wearing the lenses. Which change is MOST LIKELY to reduce these symptoms:

   R: +2.50 -0.50 x 090 / BC: +6.50DS / CT: 4.5mm
   L: +4.50 -0.50 x 090 / BC: +8.00DS. / CT: 5.5mm

   A. Change Right lens to BC: +4.50DS / CT: 4.5mm
   B. Change Left lens to BC: +8.00 DS / CT: 6.5mm
   C. Change Left lens to BC: +7.00 DS / CT: 4.5mm
   D. Change Right lens to BC: +6.50 Ds / CT: 3.5mm

F. Absorptive Lenses

1. What is the transmission of light through a combination of:
   Sunglasses (T = 45%)
   Tinted Contact Lenses (T = 90%)

   A. 41%
   B. 45%
   C. 55%
   D. 90%

2. What is the transmission of light through an uncoated clear spectacle lens (n = 1.65):

    A. 93.9%
    B. 88.2%
    C. 75.5%

3. The application of an anti reflective coating to the surface of a clear plastic spectacle lens can increase the transmission of visible light:

    A. True
    B. False

4. A tinted plastic spectacle lens has maximal transmission at 450nm. What color does the lens appear to be:

    A. Red
    B. Yellow
    C. Brown
    D. Blue

5. Which tint will transmit the LEAST UV radiation due to lens color alone:

    A. Blue
    B. Green
    C. Gray
    D. Yellow

G. Considerations for High Powered Lenses

1. A patient is wearing a spectacle prescription of +11.00 DS, OU. What is the corneal refraction if the vertex distance is 13 mm:

    A. +9.62 DS
    B. +11.00 DS
    C. +12.84 DS

2. Advantages of using aspheric lens design for a +4.00 DS spectacle lens include (more than 1 may be correct):

    A. Thinner lenses
    B. Flatter base curve
    C. Better central optics
    D. Lighter lenses

3. Advantages of high index plastic spectacle lens materials include (more than 1 may be correct):

    A. Less chromatic aberration
    B. Thinner lenses
    C. Lower cost
    D. Flatter base curves

4. The ring scotoma created by high plus powered spectacle lenses is caused by:

    A. Prismatic effect
    B. Spherical Aberration
    C. Chromatic Aberration
    D. Distortion

5. Which is NOT true regarding high plus powered spectacles lenses:

    A. It is more difficult to control lens aberrations
    B. Can result in high positive fusional vergence demands at near
    C. Can create barrel distortion
    D. May require the use of aspheric design

Answers:

A: 1.A, 2.C, 3.D, 4.A, 5.A, 6.D
B: 1.AB, 2.B, 3.C, 4.C, 5.D, 6.B, 7.A
C: 1.B, 2.B, 3.C, 4.D, 5.D, 6.D, 7.D, 8.D, 9.C, 10.B, 11.A, 12.B, 13.A
D: 1.D, 2. C, 3.D, 4.A, 5.B, 6.C, 7.C, 8.A
E: 1.E, 2.C, 3.BC, 4.B, 5.A, 6.C
F: 1.A, 2.B, 3.A, 4.D, 5.D
G: 1.C, 2.ABD, 3.BD, 4.A, 5.C