VISUAL OPTICS

QUESTION BANK

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IMPORTANT PORTIONS

GEOMETRIC OPTICS, VERGENCE AND POWER

1) Sign convention
2) Magnification
3) Aberration
4) Catroptic power
5) Cardinal points
6) Conjugacy
7) Object space and image space
8) Diffraction
9) Polarization
10) Dichroism
11) Flurescene
12) Interference
13) Spherical mirror
14) Spherical refracting surface
15) Applications of interference
16) Types of diffraction

17) Properties of light
18) Laser
19) Radiometry
20) Photometry
21) Types of mirrors
22) Application of retroreflection
23) Retroreflection
24) Laws of reflection
25) Convex lens
26) Concave lens
27) Cardinal data of lens
28) Cylindrical lens
29) Uses of cylindrical lens
30) Sturms conoid
31) Angular magnification
32) Dioptric power
33) Geneva lens measure
34) Catoptrics images

OPTICS OF OCULAR STRUCTURE

1) Optics of cornea,ac and crystalline lens
2) Eye as an optical instrument
3) Schematic eye
4) Reduced eye
5) Cardinal data of the gullstrands schematic eye
6) Donders reduced eye

MEASUREMENT OF OPTICAL CONSTANTS OF EYE

1) Axes of eye
2) Pachymetry
3) Keratometry
4) Spatial and temporal resolution
5) Visual acuity components

6) Ophthalmophakometry
7) Corneal curvature
8) Visual angles
9) Light and dark adaptation
10) Color vision
11) Visual angle
12) Snellen chart and procedure of testing
13) Measurement of visual acuity in preschool children
14) Okn
15) Plt
16) Arden ratio
17) Contrast sensitivity charts
18) Near vision chart
19) Hotv chart
20) Logmar chart

REFRACTIVE ANOMALIES AND THEIR CAUSE

1) Growth of eye in relation to refractive errors.

REFRACTIVE CONDITIONS

1) Define myopia ,types and treatment
2) Hyperopia
3) Ametropia
4) Components of ametropia
5) Signs and symotoms of hyperopia
6) Components of hyperopia depending upon accommodation
7) Aphakia and optics
8) Pseudophakia
9) Roving ring scotoma
10) Optics of myopia
11) Types of regular astigmatism
12) Optics of astigmatism
13) Investigations and treatment of astigmatism
14) Anisometropia
15) Irregular astigmatism

16) Worth four dot test
17) Aniseikonia
18) Space eikonometer
19) Asthenopia
20) Symptoms of astigmatism

ACCOMMODATION

1) AC/A ratio
2) Accommodation
3) Farpoint
4) Normal ac/a ratio
5) Range of accommodation
6) Depth of field and depth of focus.
7) Assessment of accommodation
8) Convergence
9) Presbyopia and causes

OBJECTIVE REFRACTION

1) Define retinoscopy
2) Principle of retinoscopy
3) Objective and subjective refraction
4) Clinical refraction
5) Optics and procedure of retinoscopy
6) Problems in retinoscopy
7) Dynamic and static retinoscopy
8) Mem and nott retinoscopy
9) Phoropter
10) End point of retinoscopy
11) Straddling
12) Streak retinoscopy
13) Wet and dry retinoscopy
14) Tonus allowance of atropine
15) Redreflex

SUBJECTIVE REFRACTION

1) Astigmatic clock dial
2) Fogging
3) Prism dissociation method
4) Jcc
5) Ocular and spectacle refraction
6) Spectacle magnification
7) Binocular refraction
8) Ocular and soectacle accommodation
9) Difficulties in subjective and objective refraction
10) Maddox v test
11) Astigmatic fan test
12) Pinhole
13) Duchrome test
14) Spherical equivalent
15) Subjective refraction

QUESTION BANK

ESSAY (10 MARKS)

1. Enumerate the ocular changes during accommodation. Write in detail about various methods to calculate the amplitude of accommodation. Write in detail various treatment options of presbyopia.
2. Streak retinoscopy – principle, technique and uses in optometry
3. Explain the mechanism of accommodation. Write in detail about etiology ,diagnosis and treatment of presbyopia
4. Aphakia – causes, clinical features and management.
5. Write in detail about Gullstrand simplified schematic eye and reduced eye.
6. Write in detail about Illumination, Reflex and Projection stage of plane mirror retinoscopy in hypermetropia and myopia with clear diagram. What are the causes of inaccurate retinoscopy findings
7. Explain in detail about the procedure and recording of following subjective refraction techniques-

    a) Duochrome test

    b) Refinement of cylindrical axis and power by J.C.C

8. Keratometer – principle and types of Keratometer , technique and use of keratometry in optometry
9. Write in detail about visual acuity and visual acuity charts.
10. Explain retinoscopy under following:

    • Procedure • Interpretation of result • Problems

11. Explain the mechanism of accommodation. Describe in detail about measurement of amplitude of accommodation by using minus lens and push to blur method.
12. Define and classify myopia. What are the various options for correction of myopia
13. Discuss various methods of subjective verification of refraction.
14. Define accommodation and discuss the mechanism of accommodation. How the near point of accommodation is measured.
15. Define myopia. Discuss the etiology, clinical types and treatment of myopia.
16. Define hypermetropia and mention its components. Describe its correction with spectacle lens.

17. Enumerate in detail the various techniques of subjective refraction.
18. Define myopia. What are the types of myopia and describe the myopic correction with spectacle lens.
19. Define retinoscopy , describe the optics of the stages of retinoscopy and explain the pre-requisites for retinoscopy .
20. Define astigmatism. Discuss the etiology, optical conditions, types and treatment of astigmatism.
21. Explain streak retinoscopy under following-

    -Procedure -Stages of retinoscopy – Straddling

22. Explain hypermetropia under following -

    - Aetiology -Clinical features -Treatment

23. Discuss the optics of myopia and its types with neat diagrams. Describe the method of spectacle prescription in a case of myopia.
24. Elaborate the clinical features of astigmatism. Discuss in detail strums conoid
25. Discuss the optics of aphakia with neat diagrams. Describe the advantages and disadvantage of spectacle prescription in a case of aphakia.

SHORT NOTES (5 MARKS)

1. What is pseudo myopia. How is it detected.
2. What are the mirrors used in retinoscope.
3. Discuss the disadvantages of myopic spectacle correction
4. Describe the three stages of retinoscopy for a myopic eye
5. What is reduced eye model
6. Describe “Jack in the box” phenomenon
7. What is reduced eye. Describe with diagram.
8. What is Jackson’s cross cylinder. Describe its use.
9. Discuss magnification in aphakia corrected with spectacles.
10. Etiology of hyper metropia
11. Ophthalmoscopic findings seen in pathological myopia
12. Jackson cross cylinder

13. Spectacle magnification and relative spectacle magnification
14. Duochrome test
15. Types of retinoscope
16. Keratometry
17. Latent, manifest and facultative hyper metropia
18. Clinical features of pathological myopia
19. Sturm’s conoid
20. Principle and procedure of baush and lomb keratometry
21. Discuss the various components of hypermetropia
22. Total internal reflection of light and critical angle
23. Role of cornea and lens in ocular refraction
24. Toric transposition
25. Difficulties in retinoscopy
26. What is a cross cylinder and mention its uses
27. Back vertex distance and power
28. Principles and uses of lensometer
29. Fresnel prism.
30. Draw the schematic representation of reduced eye and mark the cardinal points.
31. Pathological myopia
32. Presbyopia
33. Pin hole
34. Sturm’s conoid
35. Principle and procedure of baush and lomb keratometry
36. Discuss the various components of hypermetropia
37. Total internal reflection of light and critical angle
38. Role of cornea and lens in ocular refraction
39. Jackson's cross cylinder
40. Draw the schematic representation of reduced eye and mark the cardinal points
41. Problems encountered in retinoscopy
42. AC/A ratio: explain the clinical importance
43. Astigmatic fan test
44. Sign convention
45. Treatment for presbyopia
46. Refinement of cylindrical axis and power by J.C.C

47. Binocular balancing methods.
48. Optics of prism and application of prisms in ophthalmology.
49. Pinhole
50. Jacksons cross cylinder
51. Anisometropia
52. Cardinal points.
53. Aberration.
54. Sign convention.
55. Visual acuity
56. Difficulties of retinoscopy
57. Myopia
58. Changes of refraction with age
59. Clinical features of hypermetropia
60. Procedure of streak retinoscopy
61. Procedure of neutralizing meridians with streak retinoscope
62. Components of Hypermetropia
63. Importance of keratometry readings in clinical practice
64. Presbyopia
65. AC / A ratio
66. Prisms
67. Draw a schematic representation of the reduced eye marking the cardinal points.
68. Measurement of corneal curvature
69. Myopia
70. Presbyopia
71. Sign convention
72. Importance of Keratometry readings in clinical practice
73. Aetiology, diagnosis and treatment of Pathological myopia
74. Duochrome test
75. Explain the rule of transposition by giving one example
76. Optics of streak retinoscopy in myopia with diagram.
77. Aetiology and treatment of pathological myopia
78. Reduced eye

ANSWER BRIEFLY (2 marks)

1. What is spherical equivalent. List down its importance
2. What is the importance of IPD (Inter Pupillary Distance) marking in spectacle dispensing
3. Optics of Manual Lensometer
4. What is far point of accommodation
5. List down the techniques to measure spectacle prescription
6. Define spectacle magnification and relative spectacle magnification.
7. What do you mean about Vergence of light and conjugate points.
8. What are the characteristics of the movement of reflex during retinoscopy
9. What is fogging. What might occur if the patient is not fogged prior to beginning the subjective refraction.
10. Sign convention used in geometrical optics
11. What do you mean by spherical equivalent. Calculate the spherical equivalent of -4.00DS/-0.50DCX45○
12. What are the different surgical options available for treatment of myopia
13. What is spherical equivalent of following prescription: -2.00DS/-3.00 DC X110
14. What is trial frame. What are its parts.
15. What are the causes for a dull glow in retinoscopy
16. What is duochrome test 9. What is far point of accommodation. How is it detected.
17. Comment about optical condition in myopia
18. Explain the rule of simple transposition by giving one example
19. Refractive ametropia
20. How would you verify the neutralization point during retinoscopy
21. What are the modes of treatment of presbyopia
22. Classify regular astigmatism with one example of each type
23. Define the following terms- -Range of accommodation -Depth of focus
24. What is pseudo myopia. Which clinical conditions it is seen
25. Photochromic lenses
26. Base curve of spectacle lens
27. Astigmatic fan
28. How cross cylinder is used to refine the axis of a cylindrical lens.
29. Spherical aberration

30. Prentice rule
31. Hypermetropia and normal age variation
32. Principle of retinoscopy
33. Cycloplegic refraction
34. Do the toric transposition of +4.0 DS – 1.5 D. Cyl 90 degrees (Base curve -6.0)
35. High index lenses
36. Dynamic retinoscopy
37. Aspheric lenses
38. Image size in ametropia
39. Donder's reduced eye
40. Chromatic aberration
41. Stenopic slit test
42. Depth of field
43. Find out the resultant power of this combination. (+2 D.cyl 90) + (+4 D cyl 180)
44. Photochromic lenses
45. Base curve of spectacle lens
46. Astigmatic fan
47. How cross cylinder is used to refine the axis of a cylindrical lens.
48. Spherical aberration
49. Prentice rule
50. Hypermetropia and normal age variation
51. Principle of retinoscopy
52. Cycloplegic refraction
53. Do the toric transposition of +4.0 DS – 1.5 D. Cyl 90 degrees (Base curve -6.0)
54. RAF rule
55. Principle of Bausch-Lomb keratometer
56. Inter pupillary distance
57. Simple transposition
58. Dynamic retinoscopy
59. Uses of Maddox rod
60. Anisometropia
61. Atiopine
62. Find out the spherical equivalent of -3.00 DS/-1.00 DC 90°
63. What is back vertex distance. How will you measure it.

64. Near point of accommodation
65. Astigmatic fan test
66. Growth of the eye and refractive errors
67. Dark adaptation
68. Spectacle magnification and relative spectacle magnification
69. A 65 years old patient whom you find has had a hyperopic shift in their
70. Prescription since the last visit. What are the two possible etiologies
71. Explain the newer correction methods available for progressive myopia
72. Explain scissor's reflex. Which clinical conditions it is seen
73. Calculate the spherical equivalent of +4.00 DS/-3.00 DCX50
74. Which type of patients give poor results in Duochrome test and always prefer red
75. Color
76. An emmetropic eye with near point located at a distance of 10 cm in front of spectacle Plane. What is the range and amplitude of accommodation
77. What are the different types of acquired myopia
78. What are the different types of regular astigmatism
79. What do you mean about Vergence of light and conjugate points
80. Define-Depth of focus
81. Knapp's rule and its application
82. Relationship between accommodation and convergence
83. Difficulties in subjective and objective refraction tests
84. Cardinal points
85. Colour vision
86. Explain the end point of refraction
87. Explain the causes for Anisometropia
88. In Aphakia, nodal point of the eye is moved backwards. TRUE / FALSE. Give
89. Reason
90. Classify regular astigmatism.
91. Explain the possible causes of inaccurate Retinoscopic findings
92. Far point of accommodation
93. Jacksons Cross Cylinder.
94. Duochrome test
95. "ndex Hypermetropia.
96. Straddling technique

97. Write type of astigmatism in each of the following sphero-cylindrical combinations- a +3.00DS/-2.50DCX45 • +1.00DS/-2.25 DCX 110
98. Explain MAR and log MAR value of 6/6
99. Explain the factors affecting pupillary size
100. Differentiate between facultative and absolute hypermetropia
101. Explain non-surgical methods of myopia control
102. Calculate spherical equivalent of -2.00 DS/-1.00DCX135
103. What is scissor's reflex. Which clinical conditions it is seen.
104. Define spectacle refraction
105. How do you verify the end point of retinoscopy
106. Enumerate the tests available to refine the direction and power of astigmatism
107. Vitreous.
108. Dark adaptation.
109. Name any four color vision tests
110. AC/A ratio
111. Principle of keratometry.
112. Fogging
113. Principle of Bausch and Lomb keratometer
114. With the rule astigmatism
115. Fresnel prism
116. Near point of accomodation
117. The cross cylinder form of a prescription is as follows. +3.0 D cyl x 90 and +1.5 D cyl x 180. Convert the prescription to minus and plus sphero cylindrical form.
118. Calculate the amplitude of accommodation required to see an object at 1O cm for +4.0 D hyperopia. 15. Depth of focus
119. Angle kappa
120. Dynamic retinoscopy
121. Give one example of against the rule astigmatism and compound myopic astigmatism
122. Spectacle and relative spectacle magnification
123. What is pseudo myopia. Which clinical conditions it is seen.
124. Comment about optical condition in hypermetropia
125. What is meant by fogging. What might occur if the patient is not fogged prior to beginning the subjective refraction.
126. Define the following terms: • spherical equivalent • depth of field

127. LASIK
128. Differentiate between the terms – latent hypermetropia and manifest hypermetropia
129. Congenital myopia
130. What are the symptoms of presbyopia.
131. Optics of neutrality in retinoscopy
132. Near point of accomodation
133. Depth of focus
134. Maddox rod
135. The prentice rule
136. Do the toric transposition of +3.5 D sph I+ 2.0 D cyl 1800 (Base curve +6.00 and -6.00)
137. Calculate the spherical equivalent of +1.0 D sph/ +3.0 D cyl 1800
138. Sturm conoid
139. Far point
140. Aniseikonia
141. What is spherical equivalent. What is its importance
142. What is transposition. What is its significance.
143. What is neutralization point in refraction. How it is achieved.
144. What is the importance of axial length in ametropia.
145. What is retinal image blur.

GIVE PRECISE ANSWER (1 MARK)

1. In keratoconus, ---------- reflex is seen on retinoscopy.
2. In accommodation, the ---------- muscle contracts in response to
3. Parasympathetic stimulation making the zonules relax.
4. Visual angle is between .....axis and .....axis
5. " +3.00 DS / -1.00 DC X 180 is an example of .....astigmatism"
6. The distance an object can be moved without noticeable blurring of the image is
7. Termed ----------
8. If the spectacle correction is -5.00 DS at vertex distance of 13mm,..... Will be the effective power on corneal surface
9. 1 mm increase in radius of curvature of cornea leads to hyper metropia of……...
10. The retinoscopy done with the patient's eyes fixed at a near distance is known as …….

11. …… is a condition of refraction wherein a point focus of light cannot be formed upon the retina.
12. …… is a congenital condition of the eye in which axial myopia is seen
13. Pseudo myopia is a condition seen in……
14. What is the importance of cycloplegic refraction
15. What is spectacle refraction
16. What is the normal corneal curvature 13.What is astigmatic fan
17. What is "with the rule" astigmatism
18. Spectacle magnification is defined as……
19. "Scissors reflex" during retinoscopy is found in……
20. The intermediate addition is usually ……of near addition
21. In the higher degrees of myopia, whole of the posterior pole of the eye herniated backwards resulting in a condition called.....
22. Type of refractive error in newborns
23. The optometer principle is used in ----------
24. ---------- is a drug which has only mydriatic effect without cycloplegia
25. Segment top of spectacle lens should be at the level of ----------
26. ---------- is based on the fact that the anterior surface of the cornea acts as a convex mirror and the size of the image formed varies with its curvature
27. Myopic crescent is mostly found in ..... Region of optic disc
28. During subjective refraction refinement of cylindrical.....done before.....
29. An uncorrected myopic patient will see letter in .....background clearer in Duochrome
30. Test
31. The spherical equivalent of +/-0.25D J.C.C is.....
32. The power of reduced eye is about .....
33. Difference in spherical equivalents between the two eyes is termed ---------.
34. Administration of ---------- eye drops in children is being tried to reduce the
35. Progression of myopia.
36. The angle between the pupillary axis and the visual axis is termed ---------.
37. Scheiner principle is used in ----------.
38. Visual axis is the line connecting the fixation target and ----------
39. Early in infancy, majority of children found to have _____ type of
40. Refractive anomaly.
41. In pathological myopia, myopic crescent is usually seen in the _____ margin

42. Of the optic disc.
43. _____ is an example for with the rule astigmatism
44. Dioptric difference between far point of accommodation and near point of
45. Accommodation gives _____
46. _____type of hypermetropia can be overcome by an effort of accommodation.
47. The angle between the optical axis and visual axis of the eye is called ------- angle
48. The refractive status in newest born children is ----------
49. Unequal image size in the two eyes is termed ----------.
50. ---------- is an example of monochromatic /Seidel aberration.
51. Refractive index of crystalline lens is ----------.
52. Donder's reduced eye is an ideal spherical surface having radius of curvature of
53. _____mm.
54. _____ is a condition of refraction wherein a point focus of light cannot be
55. Formed upon the retina.
56. The linear distance traversed by the point of conjugacy in moving from far point to
57. Near point of accommodation is known as _____.
58. In the higher degrees of myopia, whole of the posterior pole of the eye herniated
59. Backwards resulting in a condition called _____
60. +1.75dsph/-1.25Dcyl x 170 is an example for .....type of astigmatism
61. Actual power of +/- 0.25 cross cylinder is.....
62. Posterior focal point for an Aphakic eye lies ..... Mm behind cornea and.....mm
63. Behind eye ball
64. Range of accommodation is defined as.....
65. Pupillary constriction leads to.....in depth of focus
66. If Ametropia is purely axial in origin.....will be the treatment of choice
67. _____ is a congenital condition of the eye in which axial myopia is seen.
68. Unit of physiological accommodation is _____
69. In uniocular aphakia, there is a difference of _____% between the two images of both eyes
70. Dioptric difference between far point of accommodation and near point of accommodation gives _____.
71. In Gullstrand's schematic eye, primary nodal point lies _____ mm from the corneal apex
72. Refractive index of lens nucleus.

73. Explain the normal amplitude of accommodation.
74. Angle kappa.
75. HVID and VVID of cornea.
76. Principle of duochrome test.
77. …….. Is the instrument used for measuring the thickness of cornea.
78. Maximum retinal image size difference that can be tolerated between the two eyes is ……..%.
79. In pathological myopia, myopic crescent is usually seen in the ……. Margin of optic disc.
80. Amplitude of accommodation is defined as ……..
81. …….. Is strongest cycloplegic available.
82. Index hypermetropia is seen in ……
83. Optometer principle is used in …….
84. Two uses of lensometer
85. Scissor shadow is seen in ……..
86. One condition producing astigmatism against the rule.
87. Vertex distance should be specified for prescription of more than ---------- diopters
88. The effective power of a convex lens ---------- as it is moved away from the eye
89. ---------- is the centre of optical system formed by the lens and all rays passing through it are undeviated
90. Anti reflective coatings on spectacle lenses are based on the principle of ----------
91. Far point of an emmetropic eye is at ----------
92. Candela isthe unit of measure for -------
93. The angle between the pupillary axis and visual axis is called
94. Badalprincipleisusedin--------
95. Cycloplegic effect of atropine lasts for days .
96. Straddling is used to refine
97. Corneal curvature is measured using _
98. The Scheiner principle is used in _
99. The angle between the optical axis and the visual axis is called _
100. Cycloplegic effect of homatropine lasts for days.
101. The far point of a non accommodated hypermetropic eye is located the retina.
102. Vertex distance should be specified for prescription of more than ---------- diopters
103. The effective power of a convex lens ---------- as it is moved away from the eye

104. ---------- is the centre of optical system formed by the lens and all rays passing through it are undeviated
105. Anti reflective coatings on spectacle lenses are based on the principle of ----------
106. Far point of an emmetropic eye is at ----------
107. Range of accommodation is defined as…….
108. Diabetes is strongly associated with .....type of refractive error shift
109. At birth eye is hyperopic about……..Diopter
110. …….is an example of with the rule astigmatism
111. Aphakic subjects have.....purkinje images
112. What is the importance of pin hole testing
113. What is scissoring reflex in retinoscopy
114. Name the cycloplegic drugs.
115. What is fogging
116. What is astigmatic fan
117. Principle of Duochrome test.
118. What is astigmatic fan
119. Define emmetropization
120. What is subjective refraction
121. Name two cycloplegic drops

ANSWER KEY

ESSAY (10 MARKS)

1. Ocular changes during accommodation, any two methods to calculate the amplitude of accommodation,detailed treatment options of presbyopia.
2. Streak retinoscopy : Difinition (2) principle (2)technique and uses in optometry (6)
3. Mechanism of accommodation with diagram (3) ,etiology (2) ,diagnosis and treatment of presbyopia (5)
4. Aphakia – definition (2) causes (2), clinical features(3) , management (3)
5. Gullstrand simplified schematic eye (5) reduced eye (5).explain with neat diagram.
6. Illumination, Reflex and Projection stage of plane mirror retinoscopy in hypermetropia and myopia with clear diagram (7). What are the causes of inaccurate retinoscopy findings (3)
7. Procedure and recording of duochrome test (5), Procedure and recording of refinement of cylindrical axis and power by J.C.C (5)
8. Principle of Keratometer (2), types of Keratometer (3) , technique (3) , use of keratometry in optometry (2)
9. Visual acuity (5) ,visual acuity charts (5)
10. Retinoscopy :Procedure (5) , Interpretation of result(3), Problems (2)
11. Mechanism of accommodation (4), measurement of amplitude of accommodation by using minus lens and push to blur method (6)
13. Define (2), classify myopia(5), correction of myopia (5)
14. All methods of subjective refraction including trial and error method, JCC, duochrome test (10)
15. Define accommodation (3), mechanism of accommodation (4) , near point of accommodation (3).
16. Define myopia (2), Discuss the etiology (2) ,clinical types (3) treatment of myopia(2)
17. Define hypermetropia (2), component (3), correction with spectacle lens.(5)
18. All methods of subjective refraction including trial and error method, JCC, duochrome test
19. Definition of myopia (2), What are the types of myopia (5), myopic correction with spectacle lens (3)

20. Define retinoscopy (3) , optics of the stages of retinoscopy (4), pre-requisites for retinoscopy (3)
21. Define astigmatism (2) Discuss the etiology(2), optical conditions (2), types (2), treatm5ent of astigmatism (2).
22. Streak retinoscopy procedure (3), Stages of retinoscopy (4), Straddling (3).
23. Hypermetropia definition (2), Aetiology (2), Clinical features (2) , Treatment (2).
24. Optics of myopia (3) ,types with neat diagrams(4), method of spectacle prescription in a case of myopia (3)
25. Clinical features of astigmatism(4), strums conoid with diagram(6)
26. Optics of aphakia with neat diagrams (5). advantages and disadvantage of spectacle prescription in a case of aphakia.(5)

SHORT NOTES (5 MARKS)

1. Definition of pseudo myopia, classification, clinical features, and treatment.

2. Description of concave mirror and plane mirror for objective refraction.explain optics

3. Explanation of minification of retinal images, reduced peripheral vision, and cosmetic concerns.

4. Overview of observing reflex, achieving neutrality, and determining refractive error.

5. Explanation of simplified eye model used in optics and its significance in understanding basic principles.

6. Definition and occurrence of reflex disappearance and reappearance due to accommodation.

7. Utilization of the lens to determine cylindrical lens power and axis.

8. Explanation of perceived enlargement with high-powered lenses in aphakic correction.

9. Etiological factors such as short axial length, corneal/lens abnormalities, or reduced refractive power.

10. Mention of myopic crescents, staphyloma, and chorioretinal atrophy in pathological myopia.

11. Description of the lens's role in refining the power and axis of astigmatism.

12. Explanation of apparent enlargement through lenses and the ratio comparing object sizes through different lenses.

13. Description of the subjective refraction test using two colors to determine optimal lens power.

14. Overview of spot, streak, and Welch Allyn retinoscope variations in design and lighting.

15 Description of corneal curvature measurement aiding in diagnosing irregularities and contact lens fittings.

15. Types of Retinoscope: Various types include streak retinoscopes, spot retinoscopes, and Welch Allyn retinoscopes. Streak retinoscopes produce a streak of light for refraction, spot retinoscopes use a round light spot, and Welch Allyn retinoscopes have different light sources and use a spot/streak combination.

16. Keratometry: Keratometry is a diagnostic test used to measure the curvature of the cornea, providing information crucial for fitting contact lenses and assessing corneal astigmatism.

17. Latent, Manifest, and Facultative Hypermetropia: Latent hypermetropia refers to hyperopia corrected by accommodation, manifest hypermetropia is the total hyperopia, and facultative hypermetropia is the difference between latent and manifest hypermetropia.

18. Clinical Features of Pathological Myopia: Pathological myopia includes a range of eye issues such as myopic macular degeneration, retinal detachment, and the presence of myopic crescents, leading to increased risk of vision loss and other eye diseases.

19. Sturm’s Conoid: A theoretical conoid surface used to represent how light rays interact with optical systems in ametropia.

20. Principle and Procedure of Bausch and Lomb Keratometry: This involves using a Bausch and Lomb keratometer, a device to measure corneal curvature. The procedure includes aligning the mires with the corneal curvature, applying optical principles to derive the corneal curvature measurements.

21. Components of Hypermetropia: Hypermetropia results from short eye length, reduced corneal/lens refractive power, or reduced accommodation.

22. Total Internal Reflection of Light and Critical Angle: When light moves from a denser to a less dense medium and the angle of incidence exceeds the critical angle, light undergoes total internal reflection within the denser medium.

23. Role of Cornea and Lens in Ocular Refraction: Cornea contributes about two-thirds of the eye's refractive power, while the lens fine-tunes the focus and provides accommodation.

24. Toric Transposition: Toric transposition refers to converting a prescription between minus and plus cylinder form, mainly for astigmatism correction.

25. Difficulties in Retinoscopy: Retinoscopy challenges may include patient cooperation, media opacity, improper room lighting, or inadequate refractive correction.

26. Cross Cylinder and its Uses: It's a lens used in subjective refraction to refine cylindrical axis and power in astigmatism correction.

27. Back Vertex Distance and Power: It's the distance between the back surface of a lens and its focal point, affecting the lens power.

28. Principles and Uses of Lensometer: Lensometer measures lens power, axis, and cylindrical power, ensuring accuracy and reliability of prescriptions.

29. Fresnel Prism: It's a thin, flat, lightweight plastic prism used in ophthalmology, mostly for its lightness in various applications, such as correcting double vision.

30. Schematic Representation of Reduced Eye and Cardinal Points: A simplified drawing showing the key points (principal points, nodal points, fovea) of an eye model used to explain optical concepts.

31. Pathological Myopia: This is severe myopia leading to eye structural changes and potential vision loss due to elongation of the eye, leading to retinal thinning or degeneration.

32. Presbyopia: Age-related loss of near vision due to the reduced elasticity of the lens, leading to difficulty focusing on close objects.

33. Pinhole: A small aperture that improves visual acuity by decreasing the blur circle size in refractive errors.

34. Sturm's Conoid: It's a theoretical surface illustrating the change in the refractive power distribution in astigmatism.

35. Principle and Procedure of Bausch and Lomb Keratometry:** A technique to measure the corneal curvature that is essential for contact lens fitting and diagnosing corneal irregularities.

36. Components of Hypermetropia: Hypermetropia involves a shorter eye, insufficient corneal/lens power, or reduced accommodative ability.

37. Total Internal Reflection and Critical Angle: It occurs when light within a denser medium is reflected back instead of refracted out due to exceeding a specific angle, known as the critical angle.

38. Role of Cornea and Lens in Ocular Refraction: The cornea and lens collaborate to focus light onto the retina for clear vision, contributing majorly to the eye's refractive power.

39. Jackson's Cross Cylinder: A lens used in subjective refraction to fine-tune astigmatism power and axis.

40. Schematic Representation of Reduced Eye: A simplified eye model highlighting principal points such as the nodal and cardinal points.

41. Problems Encountered in Retinoscopy: Issues like poor patient cooperation, media opacity, insufficient correction, or incorrect room lighting can affect the accuracy of retinoscopy.

42. AC/A Ratio: The measurement of how much convergence occurs for a certain amount of accommodation and is crucial in diagnosing binocular vision anomalies.

43. Astigmatic Fan Test: A subjective refraction technique determining astigmatism by rotating the cylinder axis.

44. Sign Convention: Rules used to determine whether an optical element will converge or diverge light rays.

45. Treatment for Presbyopia: Includes reading glasses, bifocals, multifocals, contact lenses, or surgical procedures like lens replacement or corneal reshaping.

46. Refinement of Cylindrical Axis and Power by J.C.C: Jackson's Cross Cylinder aids in determining the precise axis and power of astigmatism.

47. Binocular Balancing Methods: Techniques to ensure the eyes work well together to create a single, clear image. It involves treatments like prisms, vision therapy, or specialty lenses

48. Optics of Prism and Application in Ophthalmology: Prisms alter the path of light, used in glasses to correct eye alignment issues or diplopia.

49. Pinhole: As noted above, it's a small aperture that reduces blur in the vision.

50. Jackson's Cross Cylinder: The lens is used to refine the axis and power of astigmatism in subjective refraction.

Absolutely, here are concise explanations for the optometry topics:

51. Anisometropia: Condition where the refractive error significantly differs between the two eyes, leading to unbalanced vision.

52. Cardinal Points: Principal points in an optical system: the nodal, focal, and principal points.

53. Aberration: Optical imperfections causing blurred or distorted images, including chromatic, spherical, and coma aberrations.

54. Sign Convention: Rules used to determine whether an optical element will converge or diverge light rays.

55. Visual Acuity: Measure of the eye's ability to distinguish details of an object and identify the smallest identifiable letters or symbols.

56. Difficulties of Retinoscopy: Challenges faced during the process such as patient cooperation, media opacity, or examiner's technique.

57. Myopia: A refractive error where distant objects appear blurred due to the eye's excessive optical power, causing images to focus in front of the retina.

58. Changes of Refraction with Age: Includes presbyopia due to age-related loss of near vision, and changes in lens shape and power affecting refraction.

59. Clinical Features of Hypermetropia: Symptoms may include eye strain, discomfort, and near vision difficulties.

60. Procedure of Streak Retinoscopy: Involves projecting a thin beam of light onto the retina, assessing the reflex, and determining refractive error.

61. Procedure of Neutralizing Meridians with Streak Retinoscope: Rotating the streak light to align it with the axis of astigmatism, achieving neutralization of power in meridians.

62. Components of Hypermetropia: Shorter eye, low optical power of cornea or lens, or reduced accommodative ability.

63. Importance of Keratometry Readings in Clinical Practice: Essential for diagnosing astigmatism, fitting contact lenses, and evaluating corneal irregularities.

64. Presbyopia: Age-related near vision decline due to the loss of lens elasticity, leading to the need for reading glasses or bifocals.

65. AC/A Ratio: Measurement of how much convergence occurs for a specific amount of accommodation, significant in diagnosing binocular vision issues.

66. Prisms: Optical devices altering the path of light used in eyeglasses to correct eye alignment issues or diplopia.

67. Schematic Representation of Reduced Eye Marking Cardinal Points: Diagram of a simplified eye model noting principal points like the nodal and cardinal points.

68. Measurement of Corneal Curvature: Done using keratometry to assess corneal astigmatism or irregularities.

69. Myopia: A refractive error resulting in blurred distance vision caused by the focal point being in front of the retina.

Sure, here are brief explanations for these optometry topics:

70. Presbyopia: Age-related loss of near vision due to decreased flexibility of the eye's lens, resulting in difficulty focusing on close objects.

71. Sign Convention: Rules used to determine whether an optical element will converge or diverge light rays in optics. This helps predict the behavior of light in various optical systems.

72. Importance of Keratometry Readings in Clinical Practice: Keratometry provides essential information about corneal curvature, aiding in diagnosing astigmatism, fitting contact lenses, and assessing corneal irregularities.

73. Pathological Myopia: A severe form of myopia, characterized by excessive eye elongation and increased risk of retinal detachment, myopic degeneration, or other eye pathologies. Diagnosis involves measuring refractive errors and assessing the eye's health. Treatments include corrective lenses or refractive surgery, while management aims to slow disease progression.

74. Duochrome Test: A subjective refraction test utilizing red/green filters to determine the best optical correction for near vision, evaluating the eye's refractive status and astigmatism.

75. Rule of Transposition: The process of converting a prescription from plus cylinder form to minus cylinder form or vice versa. For example, a prescription of +3.00DS/-2.00DC x 180 is transposed to -5.00DS/+2.00DC x 90 for the same refractive correction.

76. Optics of Streak Retinoscopy in Myopia: In myopia, the light streak reflects in the opposite direction of movement, indicating the refractive error. A streak retinoscope

helps visualize this by showing the movement of the streak opposite to the direction of the hand movement.

77. Aetiology and Treatment of Pathological Myopia: Pathological myopia is attributed to genetic factors and excessive eye elongation. Treatments include corrective lenses or refractive surgeries, and management focuses on minimizing complications associated with high myopia.

78. Reduced Eye: An idealized model used in optometric studies, simplified to understand basic principles. This model assumes a simple, uncomplicated eye structure for theoretical calculations and studies.

ANSWER BRIEFLY (2 marks)

1. Spherical Equivalent and Importance: It represents a single lens power equivalent to a given prescription, aiding in prescription comparisons and simplifying vision correction assessment.

2. Importance of IPD Marking: It ensures proper alignment of the optical centers of lenses with the patient's pupils, enhancing visual comfort and accuracy of correction.

3. Optics of Manual Lensometer: It measures lens power and evaluates characteristics such as power, axis, and cylinder power.

4. Far Point of Accommodation: It's the farthest distance where the eye can focus without any accommodation, detected by identifying the maximum clear image distance.

5. Techniques to Measure Spectacle Prescription: Retinoscopy, subjective refraction, autorefraction, and objective refraction.

6. Spectacle Magnification and Relative Magnification: Spectacle magnification refers to the apparent enlargement of an object through lenses. Relative spectacle magnification is the difference in magnification between two lenses.

7. Vergence of Light and Conjugate Points: Vergence is the angle of light rays converging or diverging. Conjugate points are where light meets to form focused images.

8. Characteristics of Reflex Movement in Retinoscopy: Direction, speed, brightness, and regularity of the retinoscopic reflex.

9. Fogging and Impact on Subjective Refraction: Fogging blurs vision to prevent accommodation. Lack of fogging may lead to involuntary accommodation, affecting subjective refraction accuracy.

10. Sign Convention in Geometrical Optics: Positive (+) for object side distances/focal lengths and negative (-) for image side distances/focal lengths.

11. Spherical Equivalent Calculation: For -4.00 DS/-0.50 DC x 45°, the spherical equivalent = Sphere + 1/2 Cylinder = -4.25 DS.

12. Surgical Options for Myopia: LASIK, PRK, SMILE surgery, and implantable lenses.

13. Spherical Equivalent Calculation: For -2.00 DS/-3.00 DC x 110°, the spherical equivalent = -3.50 DS.

14. Trial Frame and Its Parts: It's used in refraction with components like temples, bridge, lens holders, and PD scale.

15. Causes for Dull Glow in Retinoscopy: Possible reasons include poor dilation, media opacities, or pathological conditions such as cataracts.

16. Duochrome Test and Purpose: A subjective test using red-green filters to refine the best sphere choice in subjective refraction.

17. Optical Condition in Myopia: Eye's focusing power causes light to converge before the retina, making distant objects out of focus.

18. Rule of Simple Transposition: It involves swapping sphere and cylinder signs in a prescription.

19. Refractive Ametropia: Refers to the eye's inability to focus light precisely on the retina, leading to blurred vision.

20. Verifying Neutralization Point in Retinoscopy: It's confirmed by observing the absence of movement in the retinoscopic reflex to confirm neutrality.

21. Treatment of Presbyopia: Treatments include reading glasses, multifocal/bifocal lenses, progressive lenses, monovision contact lenses, and surgical options like presbyopia-correcting intraocular lenses or laser surgery.

22. Regular Astigmatism Classification:

    - Simple Myopic Astigmatism: -2.00 DSph/-1.00 DCyl x 180°

    - Simple Hyperopic Astigmatism: +2.00 DSph/+1.00 DCyl x 90°

    - Compound Myopic Astigmatism: -3.00 DSph/-2.00 DCyl x 180°

    - Compound Hyperopic Astigmatism: +2.00 DSph/+3.00 DCyl x 90°

23. Range of Accommodation: The dioptric power range over which the eye can focus from its far point to near point.

    Depth of Focus: The range of distances over which an object remains in focus withinceptable visual clarity.

24. Pseudo Myop acia: Temporary nearsightedness due to sustained near work or spasm of accommodation. It can be seen in prolonged near tasks or accommodative spasm conditions.

25. Photochromic Lenses: Eyeglass lenses that darken when exposed to UV light and return to clear in the absence of UV light.

26. Base Curve of Spectacle Lens: The curvature of the lens surface that contacts the eye. It's the front surface curvature of the lens.

27. Astigmatic Fan: A set of lines of different orientations used to determine the axis and power of astigmatism during refraction.

28. Cross Cylinder for Axis Refinement: By adding and subtracting powers of a cylindrical lens in different meridians, the orientation providing the sharpest image helps refine the axis.

29. Spherical Aberration: An optical imperfection causing unfocused light rays not to meet at a single point, leading to image blur.

30. Prentice Rule: It relates the power of a lens with its decentration, calculating the induced prismatic effect due to lens tilt or off-center positioning.

31. Hypermetropia & Age Variation: Hypermetropia is farsightedness. With age, there's a decrease in the eye's focusing ability (accommodation), causing hypermetropia to become more pronounced.

32. Principle of Retinoscopy: Evaluating the refractive error of the eye by analyzing the movement and characteristics of the light reflex (reflected light) from the retina.

33. Cycloplegic Refraction: Refraction after the administration of cycloplegic drops to temporarily relax accommodation for accurate refractive assessment.

34. Toric Transposition: +4.00 DS/-1.50 DCyl 90° (Base curve -6.00) transposes to +1.50 DSph/+4.00 DCyl x 180° for a different base curve.

35. High Index Lenses: Lenses with a higher refractive index, thinner and lighter than standard lenses, providing better aesthetics and reduced magnification effects.

36. Dynamic Retinoscopy: An assessment where the patient actively accommodates to observe changes in the retinoscopic reflex.

37. Aspheric Lenses: Lenses with non-spherical curvatures providing improved peripheral vision and reduced spherical aberration.

38. Image Size in Ametropia: In ametropia, the image formed in the eye can be larger or smaller than normal due to refractive errors.

39. Donder’s Reduced Eye: An idealized simplified model of the eye for studying optics, having a single refractive surface.

40. Chromatic Aberration: An optical defect where different wavelengths of light focus at different points, causing colored fringes in the image.

41. Stenopic Slit Test: A procedure used to assess refractive errors where a narrow slit of light is passed through a series of apertures to find the sharpest vision.

42. Depth of Field: In optics, it refers to the range of distances over which an object remains in focus within acceptable visual clarity.

43. Resultant Power Calculation: (+2 D cyl 90) + (+4 D cyl 180) doesn’t just add arithmetically due to axis difference; a vectorial calculation is necessary.

44. Photochromic Lenses: Eyeglass lenses that darken when exposed to UV light and return to clear in the absence of UV light.

45. Base Curve of Spectacle Lens: The curvature of the lens surface that contacts the eye. It's the front surface curvature of the lens.

46. Astigmatic Fan: A set of lines of different orientations used to determine the axis and power of astigmatism during refraction.

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51. Principle of Retinoscopy: Evaluating the refractive error of the eye by analyzing the movement and characteristics of the light reflex (reflected light) from the retina.

52. Cycloplegic Refraction: Refraction after the administration of cycloplegic drops to temporarily relax accommodation for accurate refractive assessment.

53. Toric Transposition: +4.00 DS/-1.50 DCyl 90° (Base curve -6.00) transposes to +1.50 DSph/+4.00 DCyl x 180° for a different base curve.

54. RAF Rule: A guide used to refine cylinder power by adding +0.25 to +0.50 to the cylinder power determined in subjective refraction.

55. Principle of Bausch-Lomb Keratometer: Measures the curvature of the cornea to determine its refractive power and aid in contact lens fitting.

56. Interpupillary Distance: The distance between the centers of the pupils, crucial for ensuring proper alignment of the eyes in eyeglasses.

57. Simple Transposition: A method to change a prescription from plus to minus or vice versa, while reversing the cylinder axis.

58. Dynamic Retinoscopy: An assessment where the patient actively accommodates to observe changes in the retinoscopic reflex.

59. Uses of Maddox Rod: It's used in assessing phorias and measuring heterophoria by creating a streak of light.

60. Anisometropia: A condition where there's a significant difference in refractive error between the two eyes, leading to unequal vision.

61. Atropine: A cycloplegic agent used to dilate the pupil and relax accommodation. It's used in eye examinations and treatments.

62. Spherical Equivalent Calculation: For -3.00 DS/-1.00 DC 90°, the spherical equivalent = Sphere + 1/2 Cylinder = -3.50 DS.

63. Back Vertex Distance: It's the distance from the back surface of a lens to the eye's pupil. It is measured using a ruler or gauge from the back of the lens to the corneal plane.

64. Near Point of Accommodation: The closest point an eye can focus on an object without blur. It increases with age and decreases in presbyopia.

65. Astigmatic Fan Test: A method to determine the axis and power of astigmatism using different orientations of lines.

66. Growth of the Eye and Refractive Errors: Changes in eye length and shape can lead to refractive errors. Increased eye growth can result in myopia, and decreased growth can lead to hyperopia.

67. Dark Adaptation: The process of adjusting to dim lighting conditions from bright light, allowing the eyes to become more sensitive to low light levels.

68. Spectacle Magnification: The apparent size increase of an object through lenses. Relative spectacle magnification is the comparison of magnification between two lenses.

69. Hyperopic Shift Etiologies: Cataracts, changes in the lens due to aging, or changes in the cornea curvature could result in a hyperopic shift.

70. Newer Correction Methods for Progressive Myopia: These can include orthokeratology, pharmaceutical interventions, and specialized multifocal contact lenses.

71. Scissor's Reflex: A pattern seen in retinoscopy, often observed in irregular astigmatism, corneal scars, or other corneal irregularities.

72. Spherical Equivalent Calculation: For +4.00 DS/-3.00 DC x 50°, the spherical equivalent = +1.50 DS.

73. Poor Duochrome Test Results: Patients with color vision deficiencies may give unreliable or poor responses to the test.

74. Amplitude of Accommodation Calculation: For an emmetropic eye with a near point at 10 cm, the range of accommodation is 10 diopters, and the amplitude is 10 diopters.

75. Acquired Myopia Types: They include pseudomyopia, induced myopia, and near-work-related myopia.

76. Regular Astigmatism Types: Include simple myopic, compound myopic, simple hyperopic, and compound hyperopic astigmatism.

77. Vergence of Light and Conjugate Points: Vergence refers to the convergence or divergence of light rays. Conjugate points are where light rays meet to form focused images.

78. Depth of Focus: The range of distances over which an object remains in focus within acceptable visual clarity.

79. Knapp’s Rule: It's used to calculate the power of the addition required for near vision correction in multifocal lenses. The rule suggests adding half the near addition to the distance prescription.

80. Accommodation and Convergence: These are linked functions. Convergence occurs as the eyes turn inward when focusing on near objects to maintain binocular single vision.

81. Difficulties in Refraction Tests: Subjective refraction relies on patient responses, which can be influenced by subjective factors. Objective refraction can be challenging due to patient cooperation, eye conditions, or irregular astigmatism.

82. Cardinal Points: These are specific points on an optical system (e.g., eye) used in ray tracing, including the principal points, nodal points, and focal points.

83. Color Vision: It refers to the ability to differentiate between colors. Deficiencies may involve problems identifying certain colors or seeing them differently.

84. End Point of Refraction: It's the point at which no further change in the lens power or adjustment is required to obtain the best visual acuity.

85. Causes of Anisometropia: It can result from differences in eye growth, genetic factors, trauma, or various ocular conditions during development.

86. Aphakia and Nodal Point Movement: True. In aphakia (lack of the crystalline lens), the nodal point moves backward due to the absence of the lens's refractive power.

87. Regular Astigmatism Classification: Includes simple myopic, compound myopic, simple hyperopic, and compound hyperopic astigmatism.

88. Inaccurate Retinoscopic Findings Causes: Ocular irregularities, patient's fixation, or technical errors in performing the test can lead to inaccurate findings.

89. Far Point of Accommodation: It's the farthest point at which the eye can focus without accommodating, usually at optical infinity for a relaxed eye.

90. Jackson Cross Cylinder: A lens used in refraction to subjectively determine the power and axis of astigmatism.

91. Duochrome Test: It's a subjective test using two different-colored letters to assess a patient's refractive error, particularly useful in determining sphere power.

92. Index Hypermetropia: It's a type of apparent hypermetropia due to a higher refractive index in the lens than that of the normal eye.

93. Straddling Technique: A method to refine the axis of cylindrical lenses during subjective refraction.

94. Types of Astigmatism in Sphero-Cylindrical Combinations: First combination: With-the-rule astigmatism. Second combination: Compound myopic astigmatism.

95. MAR and Log MAR for 6/6 Vision: The Minimum Angle of Resolution (MAR) for 6/6 vision is 1.0, and its Log MAR value is 0.0.

96. Factors Affecting Pupillary Size: Light intensity, accommodation, emotional state, and medications can influence pupil size.

97. Facultative and Absolute Hypermetropia: Facultative hypermetropia is overcome by accommodation, while absolute hypermetropia remains even with maximum accommodation.

98. Non-Surgical Methods for Myopia Control: They include orthokeratology, multifocal contact lenses, and pharmaceutical interventions.

99. Calculation of Spherical Equivalent: For -2.00 DS/-1.00 DC x 135°, the spherical equivalent = -3.00 DS.

100. Scissor's Reflex: A pattern seen in retinoscopy, often observed in irregular astigmatism, corneal scars, or other corneal irregularities.

101. Spectacle Refraction: It's the process of determining the optimal lens prescription for eyeglasses based on a series of tests and patient feedback.

102. End Point of Retinoscopy Verification: The end point is verified when the neutralization of the retinoscopic reflex is achieved in all meridians.

103. Refining Astigmatism Direction and Power Tests: Techniques include Jackson Cross Cylinder and Astigmatic Fan test.

104. Vitreous: It's a clear gel-like substance filling the posterior segment of the eye, helping maintain its shape and providing support to the retina.

105. Dark Adaptation: It's the process of adjusting to dim lighting conditions from bright light, allowing the eyes to become more sensitive to low light levels.

106. Color Vision Tests: Ishihara plates, Farnsworth-Munsell 100 Hue Test, D-15 test, and Cambridge Colour Test are some examples.

107. AC/A Ratio: The Accommodative Convergence/Accommodation Ratio measures the amount of convergence (eye turn) produced by a unit change in accommodation.

108. Principle of Keratometry: Measures the curvature of the cornea, providing information for contact lens fitting and diagnosing corneal irregularities.

109. Fogging: A technique used in subjective refraction to temporarily blur the vision of the patient's better eye, encouraging accurate responses during testing.

110. Bausch and Lomb Keratometer Principle: It's a device measuring the curvature of the cornea's front surface to assess astigmatism and aid in contact lens fitting.

111. With-the-Rule Astigmatism: It's an astigmatic condition where the steepest meridian is aligned with the horizontal axis.

112. Fresnel Prism: A thin, lightweight, and flexible prism used to correct ocular deviations, attached to lenses to aid in vision correction.

113. Near Point of Accommodation: It's the closest point at which the eye can focus on an object without blur, and it increases with age.

114. Spherical Equivalent Calculation: For the given prescription, the spherical equivalent = -3.50 DS.

115. Amplitude of Accommodation Calculation: For +4.00 D hyperopia at 10 cm, the amplitude of accommodation required is 10 diopters.

116. Depth of Focus: It's the range of distances over which an object remains in focus within acceptable visual clarity.

117. Angle Kappa: It's the angle between the visual axis and the pupillary axis, where the visual axis doesn’t align with the center of the pupil.

118. Dynamic Retinoscopy: It's a retinoscopy technique performed while the patient fixates on a near target, particularly useful for children and non-verbal patients.

119. Types of Astigmatism Examples: Against-the-rule astigmatism: -2.00 DS/-1.50 DC x 90°, Compound myopic astigmatism: +3.00 DS/-2.25 DC x 180°.

120. Spectacle Magnification: It's the apparent enlargement of an object when viewed through lenses. Relative spectacle magnification compares the magnification between different lenses or prescriptions.

121. Pseudo Myopia: It's a temporary condition where the eyes appear myopic due to excessive accommodation, often seen in prolonged near work or ocular strain.

122. Optical Condition in Hypermetropia: Hypermetropia occurs when parallel light focuses behind the retina. It causes blurred vision at near and, in higher amounts, distance as well.

123. Fogging: It's the intentional blurring of vision using plus lenses to relax accommodation during subjective refraction. If the patient isn't fogged, their accommodation could mask their true refractive error.

124. Definitions: Spherical Equivalent is a single lens power that focuses light similarly to a given lens combination. Depth of Field refers to the range of distances over which an object remains in focus within acceptable visual clarity.

125. LASIK: It's a type of refractive surgery correcting vision by reshaping the cornea using a laser.

126. Latent vs. Manifest Hypermetropia: Latent hypermetropia is uncorrected hypermetropia, only evident under cycloplegic conditions. Manifest hypermetropia is the hypermetropia measured without cycloplegia.

127. Congenital Myopia: It's a rare form of myopia present at birth or early infancy due to genetic or developmental factors.

128. Presbyopia Symptoms: Symptoms include difficulty focusing on close objects, blurred vision at near, and the need to hold reading material at arm's length.

129. Optics of Neutrality in Retinoscopy: It's the point at which the retinoscopic reflex achieves neutrality, indicating the refractive error.

130. Near Point of Accommodation: It's the closest point at which the eye can focus on an object without blur, and it recedes with age.

131. Depth of Focus: It's the range of distances over which an object remains in focus within acceptable visual clarity.

132. Maddox Rod: It's a tool used in refraction to evaluate muscle imbalance or phorias, providing a way to measure the deviation of each eye.

133. Prentice Rule: It calculates the amount and direction of induced prismatic effect in lenses.

134. Toric Transposition: It's the method of converting a toric cylinder prescription from one form to another without changing the refraction's overall power.

135. Spherical Equivalent Calculation: For +1.00 DS/+3.00 DC x 180°, the spherical equivalent = +3.50 DS.

136. Sturm Conoid It describes the 3D shape of the wavefront aberrations in the eye.

137. Far Point: It's the farthest point at which the eye can focus without accommodating, usually at optical infinity for a relaxed eye.

138. Aniseikonia: It's a condition where the eyes have unequal image sizes, often resulting in visual discomfort.

139. Spherical Equivalent Importance: It provides a single sphere power that approximates the refractive status, aiding in lens prescription determination.

140. Transposition Significance: It's vital in converting one form of a prescription to another, especially when different formulas are used for different purposes.

141. Neutralization Point: It's where the retinoscopic reflex achieves neutrality, indicating the refractive error is corrected.

142. Axial Length in Ametropia: Longer or shorter axial lengths can contribute to different refractive errors like myopia or hypermetropia.

143. Retinal Image Blur: It occurs when the focused image is not sharp on the retina, leading to visual blurriness or distortion.

GIVE PRECISE ANSWER (1 MARK)

1. In keratoconus, the "scissor" reflex is seen on retinoscopy.

2. In accommodation, the ciliary muscle contracts in response to parasympathetic stimulation, making the zonules relax.

3. The visual angle is between the optical axis and the fovea's axis.

4. "+3.00 DS / -1.00 DC X 180" is an example of mixed astigmatism.

5. The distance an object can be moved without noticeable blurring of the image is termed the depth of focus.

6. If the spectacle correction is -5.00 DS at a vertex distance of 13mm, the effective power on the corneal surface will be -5.77 D.

7. A 1 mm increase in the radius of curvature of the cornea leads to hypermetropia of approximately +3.00 D.

8. The retinoscopy done with the patient’s eyes fixed at a near distance is known as near retinoscopy.

9. Myopia is a condition of refraction wherein a point focus of light cannot be formed upon the retina.

10. Axial myopia is a congenital condition of the eye in which axial myopia is seen.

11. Pseudo myopia is a condition seen in accommodative spasm or sustained near work, where the individual experiences blurred vision for distance due to excessive accommodation.

12. The importance of cycloplegic refraction is to temporarily paralyze the ciliary muscle, allowing for an accurate measurement of the eye's refractive error without the influence of accommodation.

13. Spectacle refraction is the process of determining the refractive error and prescribing appropriate lenses to correct vision using a phoropter or trial frame.

14. The normal corneal curvature typically ranges between 42 to 44 diopters.

15. An astigmatic fan is a chart or diagram used to demonstrate and diagnose astigmatism, displaying lines at different orientations and angles for testing.

16. "With the rule" astigmatism means that the steepest corneal curvature lies on the horizontal meridian (at 90 degrees), resulting in astigmatism in the same axis.

17. Spectacle magnification is defined as the apparent enlargement of an object as viewed through spectacles due to the lenses' power.

18. The "scissors reflex" during retinoscopy is found in high hypermetropia, characterized by a fast movement of the streak in one direction followed by a slow movement in the opposite direction.

19. The condition resulting from the whole posterior pole of the eye herniating backward in higher degrees of myopia is called posterior staphyloma.

20. The type of refractive error typically found in newborns is hyperopia (farsightedness).

21. The optometer principle is used in ophthalmic lenses and devices to determine the optical power required to correct refractive errors.

22. Tropicamide is a drug that has only mydriatic effects without causing cycloplegia (paralysis of accommodation).

23. The segment top of a multifocal or bifocal spectacle lens should be at the level of the lower eyelid margin.

24. Keratometry is based on the fact that the anterior surface of the cornea acts as a convex mirror, and the size of the image formed varies with its curvature.

25. Myopic crescent is mostly found in the temporal region of the optic disc.

26. During subjective refraction, refinement of cylindrical power is done before balancing (equalizing) the two eyes for binocular vision.

27. An uncorrected myopic patient will see letters on the green background clearer in the Duochrome test.

28. The spherical equivalent of +/-0.25D J.C.C (Jackson Cross Cylinder) is approximately +/-0.12D.

29. The power of a reduced eye is about decreased compared to the other eye.

30. The difference in spherical equivalents between the two eyes is termed anisometropia.

31. Administration of atropine eye drops in children is being tried to reduce the progression of myopia.

32. The angle between the pupillary axis and the visual axis is termed the kappa angle.

33. The Scheiner principle is used in the investigation of astigmatism.

34. The visual axis is the line connecting the fixation target and the fovea.

35. Early in infancy, the majority of children are found to have hyperopic type of refractive anomaly (farsightedness) due to the relatively smaller eyeball length.

36. In pathological myopia, the myopic crescent is usually seen in the temporal margin of the optic disc.

37. A cornea with its steepest curvature along the vertical meridian is an example for "with the rule" astigmatism.

38. The dioptric difference between the far point of accommodation and the near point of accommodation gives the amplitude of accommodation.

39. Manifest hypermetropia can be overcome by an effort of accommodation.

41. The angle between the optical axis and the visual axis of the eye is called the alpha angle.

42. The refractive status in newborn children is typically hyperopic due to the relatively smaller size of their eyeballs and ongoing development.

43. Unequal image size in the two eyes is termed aniseikonia.

44. Spherical aberration is an example of monochromatic/Seidel aberration.

45. The refractive index of the crystalline lens is approximately 1.406.

46. According to Donder's reduced eye, an ideal spherical surface has a radius of curvature of 7.7 mm.

47. Astigmatism is a condition of refraction wherein a point focus of light cannot be formed upon the retina.

48. The linear distance traversed by the point of conjugacy in moving from the far point to the near point of accommodation is known as the amplitude of accommodation.

49. In the higher degrees of myopia, the entire posterior pole of the eye herniating backwards resulting in a condition called posterior staphyloma.

50. +1.75 DSph / -1.25 DCyl x 170 is an example of mixed type of astigmatism.

51. The actual power of a +/-0.25 cross cylinder is approximately -0.12 D.

52. The posterior focal point for an aphakic eye lies approximately 13 mm behind the cornea and 25 mm behind the eyeball.

55. The range of accommodation is defined as the range of dioptric power over which the eye can bring objects into focus.

56. Pupillary constriction leads to an increase in the depth of focus.

57. If ametropia is purely axial in origin, contact lenses or intraocular lenses will be the treatment of choice.

58. Axial myopia is a congenital condition of the eye in which axial myopia is observed.

59. The unit of physiological accommodation is diopters (D).

60. In uniocular aphakia, there is a difference of approximately 50% between the two images of both eyes.

61. The dioptric difference between the far point of accommodation and the near point of accommodation gives the amplitude of accommodation.

62. In Gullstrand's schematic eye, the primary nodal point lies approximately 7.7 mm from the corneal apex.

63. The refractive index of the lens nucleus is around 1.406.

64. The normal amplitude of accommodation is about 15-20 diopters for a healthy adult.

65. Angle kappa is the angle between the visual axis and the pupillary axis of the eye.

66. HVID (Horizontal Visible Iris Diameter) and VVID (Vertical Visible Iris Diameter) are measurements of the cornea.

67. The duochrome test works on the principle of chromatic aberration to determine the most positive sphere.

68. A pachymeter is the instrument used for measuring the thickness of the cornea.

69. The maximum retinal image size difference that can be tolerated between the two eyes is around 5%.

70. In pathological myopia, the myopic crescent is usually seen in the temporal margin of the optic disc.

71. The amplitude of accommodation is defined as the range of dioptric power over which the eye can bring objects into focus.

72. Atropine is considered the strongest cycloplegic available.

73. Index hypermetropia is seen in individuals with a relatively smaller eye due to the shorter axial length.

74. The optometer principle is used in ophthalmic lenses and devices to determine the optical power required to correct refractive errors.

75. Lensometers are used for verifying the power of lenses and marking the optical centers.

76. Scissor shadow is seen in high hyperopia or myopia.

77. Keratoconus is one condition producing astigmatism that is usually against the rule.

78. Vertex distance should be specified for prescription of more than 4-5 diopters.

79. The effective power of a convex lens increases as it is moved away from the eye.

80. The nodal point is the center of the optical system formed by the lens, and all rays passing through it are undeviated.

81. Anti-reflective coatings on spectacle lenses are based on the principle of interference.

82. The far point of an emmetropic eye is at infinity.

83. Candela is the unit of measure for luminous intensity.

84. The angle between the pupillary axis and visual axis is called the kappa angle.

85. The Badal principle is used in adjusting the focal length in an optical system by moving the object and image distances.

86. The cycloplegic effect of atropine can last for days.

87. Straddling is used to refine the cylinder axis in a subjective refraction.

88. Corneal curvature is measured using a keratometer.

89. The Scheiner principle is used in the investigation of astigmatism.

90. The angle between the optical axis and the visual axis is called the alpha angle.

91. The cycloplegic effect of homatropine can last for days.

92. The far point of a non-accommodated hypermetropic eye is located behind the retina.

93. Vertex distance should be specified for a prescription of more than 4-5 diopters.

94. The effective power of a convex lens decreases as it is moved away from the eye.

95. The nodal point is the center of the optical system formed by the lens, and all rays passing through it are undeviated.

96. Anti-reflective coatings on spectacle lenses are based on the principle of interference.

97. The far point of an emmetropic eye is at infinity.

98. The range of accommodation is defined as the range of dioptric power over which the eye can bring objects into focus.

99. Diabetes is strongly associated with a myopic shift in refractive error.

100. At birth, the eye is hyperopic by approximately +2.00 diopters.

101. With-the-rule astigmatism is exemplified by a cornea having its steepest curvature along the horizontal meridian.

102. Aphakic subjects have four Purkinje images. The fourth Purkinje image arises due to the lack of the crystalline lens.

103. Pinhole testing is important in assessing refractive errors. It helps determine the best-corrected visual acuity and can provide information about potential refractive issues when vision is improved through a pinhole.

104. Scissoring reflex in retinoscopy is a particular movement of the light reflex (reflected light) observed during the retinoscopic examination, indicating high hyperopia or high myopia.

105. Cycloplegic drugs include atropine, cyclopentolate, and homatropine, which temporarily paralyze the ciliary muscles, preventing accommodation.

106. Fogging is a technique used in subjective refraction where a spherical lens is placed in front of both eyes to relax accommodation during the subjective test.

107. Astigmatic fan is a chart used to determine the axis and power of astigmatism by assessing the various meridians of the eye.

108. The Duochrome test works on the principle of chromatic aberration. It employs two colors (usually red and green) to assess the best sphere by determining the clearest vision.

109. The astigmatic fan is a chart used in the diagnosis and assessment of astigmatism. It shows various lines oriented at different angles for testing and identifying the meridians of the astigmatism.

110. Emmetropization is the natural process by which the eye adjusts and aims to achieve emmetropia, or normal refractive status, typically by growing to have appropriate focusing power without the need for correction.

111. Subjective refraction is the procedure conducted by an optometrist or ophthalmologist to determine a patient's eyeglass prescription by asking the patient to choose the lenses that provide the clearest vision.

112. Two cycloplegic drops commonly used are atropine and cyclopentolate, which temporarily relax the eye's focusing mechanism for refraction assessment.