PHYSICS

BOOKS - AAKASH SERIES

OPTICAL INSTRUMENTS

Lecture Sheet Exercise I Optical Instruments Level I Main Straight Objective Type Questions

1. An optician while testing the eyes of a patient keeps a charge of letters 3 m behind

the patient and asks him to see the letters on the image of chart formed in plane mirror kept at distance 2 m in front of him. At what distance is the chart seen by the patient?

A. The person can read the letters of 6 inches from a distance of 12 m

B. The person can read the letters of 12 inches from 6 cm

C. The person can read the letters from 6m which the normal eye can read from 12 m

D. The focal length of eye lens had become half that of the normal eye.

Answer: C

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2. A longsighted person has a minimum distance of distinct vision of 50 cm. He wants to reduce it to 25 cm. He should use a

A. concavelens of focal length 50 cm

B. Convex lens of focal length 25 cm

C. Convex lens of focal length 50 cm

D. Convave lens of focal length 25 cm

Answer: C

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3. A person suffering from defective vision can see objects clearly only beyond 100 cm from the eye. Find the power of lens required so

that he can see clearly the object placed at a distance of distinct vision (D = 25cm)

A. 2D

B. 3D

C. $-2D$

D. $-3D$

Answer: B

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4. A man's near point is 0.5 m and the far point is 3m Power of spectacle lenses required for

(i) reading purposes

(ii) seeing distant objects, respectively are

A. $-2D$ and 0.33 D

B. 2D and -0.33 D

C. $-2D$ and 3D

D. 2D and $-3D$

Answer: B

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5. The focal lengths of the objective and eye lens of a microscope are 1 cm and 5 cm, respectively. If the magnifying power for the relaxed eye is 45, then the length of the tube is

A. 30 cm

B. 25 cm

C. 15 cm

D. 12 cm

Answer: C

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6. If the focal length of the objective and eye lens are 1.2 cm and 3 cm respectively and the object is put 1.25 cm away from the objective lens and the final image is formed at the infinity. The magnifying power of the microscope is

A. 150

B. 200

C. 250

D. 400

Answer: B

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7. The length of the compound microscope is 14 cm. The magnifying power for relaxed eye is 25. If the local of the eye lens is 5 cm, then the object distance for objective lens would be

A. $\frac{59}{25}cm, \frac{59}{31}cm$

B. $\frac{59}{31}cm, \frac{59}{25}$ cm

C. 3 cm, 2 cm

D. 4 cm, 1 cm

Answer: A

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8. The focal length of objective and eye lens of a microscope are 4 cm and 8 cm respectively. If the least distance of distinct vision is 24 cm

and object distance is 4.5 cm from the objective lens, then the magnifying power of the microscope will be

A. 18

B. 32

C. 64

D. 20

Answer: B

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9. In a compound microscope, the objective lens and eyepiece have a focal length of 0.95 cm and 5 cm respectively and are kept at a distance of 20 cm. If the last image is formed at a distance of 25 cm from the eyepiece. Calculated magnifying power.

A. $\frac{95}{94}cm, 94$

B. $\frac{94}{95}cm, 95$

C. $0.94cm, 94$

D. $0.95cm, 95$

Answer: A

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10. In a compound microscope, the focal length of two lenses are $1.5cm$ and $6.25cm$. If an object is placed is $2cm$ from objective and the final image is formed at $25cm$ from eye len., the distance between the two lensese is

A. 6

B. 7.75

C. 9.25

D. 11

Answer: D

 Watch Video Solution

11. The length of the compound microscope is 14 cm. The magnifying power for relaxed eye is 25. If the local of the eye lens is 5 cm, then the object distance for objective lens would be

A. 1.8

B. 1.5

C. 2.1

D. 2.4

Answer: A

Watch Video Solution

12. The focal lengths of the objective and the eyepiece of a compound microscope are 2.0cm and 3.0cm, respectively. The distance between

the objective and the eyepiece is 15.0cm. Th final image formed by the eyepiece is at infinity. The two lenses are thin. The distance, in cm, of the object and the image produced by the objective, mesured from the objective lens, are respectively.

A. 2.4 and 12

B. 2.4 and 15

C. 2.3 and 3

D. 2 and 12

Answer: A

Watch Video Solution

13. The objective and eye piece of an astronomical telescope are double convexlenses with refractive jndex 1.5. When the telescope is adjusted to infinity the seperation between the lenses is 16 cm. If the space between the lenses is now filled with water and again telescope is adjusted for infinity. Then the present separation between the lenses is

A. 8 cm

B. 16 cm

C. 24 cm

D. 32 cm

Answer: D

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14. The focal length of the lensese of an astronomical telescope are 50 cm and 5 cm. The length of the telescope when the image is

formed at the least distance of distinct vision is

A. 45

B. 55

C. $\frac{275}{6}$

D. $\frac{325}{6}$

Answer: D

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15. An astronomical telescope of tenfold angular magnification has a length of 44 cm. The focal length of the objective is

A. 4 cm

B. 40 cm

C. 44 cm

D. 440 cm

Answer: B

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16. The two lenses of a compound microscope are of focal lengths 2 cm and 5 cm. If an object is placed at a distance of 2.1 cm from the objective of focal length 2 cm the final image forms at the final image forms at the least distance of distinct vision of a normal eye. Find the magnifying power of the microscope.

A. 20

B. 6

C. 120

D. 60

Answer: C

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17. The magnification produced by the objective lens of a compound microscope is 25. The focal length of eye piece is 5 cm and it forms find image at least distance of distinct vision. The magnifying power of the compound microscope is

A. 19

B. 31

C. 150

D. $\sqrt{150}$

Answer: C

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18. The focal length of a convex lens is 10 cm.

Find its magnifying power when it is used as a

magnifying glass to form the image at (i) near point and (ii) far point.

A. 3.5, 2.5

B. 2.5, 3.5

C. 2.5, 1.5

D. 1.5, 2.5

Answer: A

 Watch Video Solution

19. A magnifying glass is made of a combination of a convergent lens of power 20D and and divergent lens of power 4D. If the least distance of distinct vision is 25cm. The magnifying power is

A. 7

B. 5

C. 3

D. 8

Answer: A

Watch Video Solution

20. The focal length of objective and eyelens of a astronomical telescope are respectively 20 cm and 5 cm. Final image is formed at least distance of distinct vision. The magnifying power will be

A. -4.8

B. -4.0

C. 4.8

D. 4.0

Answer: A

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Practice Sheet Exercise I Optical Instruments Level I Main Subjective Objective Type Questions

1. A convergent lens of power 16D is used as a simple microscope. The magnification

produced by the lens, when the final image is formed at least distance of distinct vision is

A. 6

B. 4

C. 7

D. 5

Answer: D

 Watch Video Solution

2. The maximum magnification that can be obtained with a convex lens of focal length 2.5 cm is (the least distance of distinct vision is 25 cm):

A. 10

B. 0.1

C. 62.5

D. 11

Answer: D

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3. The objective lens of a compound microscope produces magnification of 10. In order to get an over all magnification of 100 when image is formed at 25 cm from the eye, the focal length of the eye lense should be (in cm)

A. 4

B. 10

C. $\frac{25}{9}$

D. 9

Answer: C

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4. Four lenses A, B, C and D of power +100D, -50D, 20D and 5D. Which lenses will you use to design a compound microscope for best magnification ?

A. A and C

B. B and D

C. C and D

D. A and B

Answer: A

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5. A microscope consists of two convex lenses of focal lengths 2.0 cm and 6.25 cm placed 15.0 cm apart. Where must the object be placed so

that the final virtual image is at a distance of 25 cm from the eye ?

A. 2.5 cm

B. 2 cm

C. 1.5 cm

D. 3 cm

Answer: A

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6. When an object is placed 40cm from a diverging lens, its virtual image is formed 20cm from the lens. The focal length and power of lens are

A. 46.17 cm

B. 42 cm

C. 4.17 cm

D. 40 cm

Answer: A

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7. The magnifying power of an astronomical telescope for normal adjustment is 10 and the length of the telescope is 110cm..Find the magnifying power of the telescope when the image is formed at the least distance of distinct vision for normal eye.

A. 14

B. 48

C. 28

D. 52

Answer: A

Watch Video Solution

8. A telescope, consisting of an objective of focal length 60 cm and a single eye lens of focal length 15 cm is focused on a distant object in such a way that parallel rays comes out from the eye lens. If the object subtends

an angle 2^{o} at the objective, the angular width of Che image is

A. 10°

B. 8°

C. 5°

D. $1/6^{\circ}$

Answer: B

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9. An astronimical telescope has an angular magnification of magnitude 5 for distant objects. The separation between the objective and the eye-piece is 36 cm and the final image is formed at infinity. The focal length f_0 of the objective and the focal length f_0 of eye-pieces are

A. $f_0 = 45cm, f_e = -9cm$

B. $f_0 = 7.2cm, f = 5cm$

C. $f_0 = 50cm, f_e = 10cm$

D. $f_0 = 30cm, f_e = 6cm$

Answer: D

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10. If tube length Of astronomical telescope is 105cm and magnifying power is 20 for normal setting, the focal length of the objective is:

A. 100 cm

B. 10 cm

C. 20 cm

D. 25 cm

Answer: A

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11. The focal length of the eyepiece and the objective of an astronomical telescope are 2cm and 100cm respectively. Find the magnifying power of the telescope for normal adjustment and the length of the telescope.

A. 50, 102 cm

B. 100, 204 cm

C. 25, 62 cm

D. 75, 125 cm

Answer: A

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12. A converging lens of 2.5cm focal length is used as a simple microscope producing virtual

image at 25cm from the eye. The position of the object from the lens is (nearly)

A. 1 cm

B. 2 cm

C. 2.2 cm

D. 4 cm

Answer: C

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13. A compound microscope is of magnifying power 100". The magnifying power of its eyepiece is 4. Find the magnification of its objective

A. 25

B. 20

C. 15

D. 30

Answer: A

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Watch Video Solution

14. The minimum magnifying power of a telescope is M. If the focal length of its eyelens is halved, the magnifying power? will become

A. M

B. 2M

C. 3 M

D. 4 M

Answer: B

Watch Video Solution

15. The magnifying power of an astronomical telescope for relaxed vision is 16 and the distance between the objective and eyelens is 34 cm. Then the focal length of objective and eyelens will be respectively

A. 17 cm, 17 cm

B. 20 cm, 14 cm

C. 32 cm, 2 cm

D. 30 cm, 4 cm

Answer: C

Watch Video Solution

16. The focal length of objective and the eyepiece of a compound microscope are 1cm and 5cm. An object is placed at a distance of 1.1 cm from the objective and if the final image is formed at infinity the magnifying power and distance between the lenses are respectively

A. 60, 16cm

B. 50, 16cm

C. 50, 15.7cm

D. 60, 16.7cm

Answer: B

Watch Video Solution

17. The magnifying power of an astronomical telescope is 8 and the distance between the two lenses is 54 cm. The focal length of eye lens and objective will be respectively.

A. 48 cm, 6 cm

B. 8 cm, 64 cm

C. 64 cm, 8 cm

D. 6 cm, 48 cm

Answer: D

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18. The focal length of the objective of a terrestical telescope is 80cm and it is adjusted for parallel rays, then its power is 20. If the

focal length of erecting lens is 20cm, then full length of the telescope will be

A. 84

B. 100

C. 124

D. 164

Answer: D

Watch Video Solution

19. A person cannot see objects clearly beyond 50.cm. The power of lens to correct the vision

A. $+5D$

B. $-0.5D$

C. $-2D$

D. $+2D$

Answer: C

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20. A person with a defective sight is using a lens having a power of $+2D$. The lens he is using is

A. Concave lens of focal length 0.5 m

B. Convex lens of focal length 2,0m

C. Concave lens with focal length 2.0 m

D. Convexlens with focal length 0.5 m

Answer: D

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21. A person wears glases of power -2.5 D. The defect of the eye and far point of the person without glasses are respectively

A. farsightness 40 cm

B. nearsightness 40 cm

C. nearsightness 250 cm

D. astigmatism 40 cm

Answer: B

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Lecture Sheet Exercise I Optical Instuments Level I Straight Objective Type Questions

1. An optician while testing the eyes finds the vision of a patient to be 6/12. By this means that

A. The person can read the letters of 6 inches from a distance of 12 m

B. The person can read the letters of 12 inches from 6 cm

C. The person can read the letters from 6m which the normal eye can read from 12 m

D. The focal length of eye lens had become half that of the normal eye.

Answer: 3

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2. A longsighted person has a minimum distance of distinct vision of 50 cm. He wants to reduce it to 25 cm. He should use a

A. concavelens of focal length 50 cm

B. Convex lens of focal length 25 cm

C. Convex lens of focal length 50 cm

D. Convave lens of focal length 25 cm

Answer: 3

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3. A person suffering from defective vision can see objects clearly only beyond 100 cm from the eye. Find the power of lens required so

that he can see clearly the object placed at a distance of distinct vision (D = 25cm)

A. $2D$

B. $3D$

C. $-2D$

D. $-3D$

Answer: 2

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4. A person can see things clearly upto 3m what is the power of lens he should use so that he can see upto 12 m ?

A. $+0.5D$

B. $-0.5D$

C. $+0.25D$

D. $-0.25D$

Answer: 4

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5. A man's near point is 0.5 m and the far point is 3m Power of spectacle lenses required for

(i) reading purposes

(ii) seeing distant objects, respectively are

A. $-2D$ and $0.33D$

B. $2D$ and $0.33D$

C. $-2D$ and $3D$

D. $2D$ and $-3D$

Answer: 2

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6. The focal lengths of the objective and eye lens of a microscope are 1 cm and 5 cm, respectively. If the magnifying power for the relaxed eye is 45, then the length of the tube is

A. $30cm$

B. $25cm$

C. $15cm$

D. $12cm$

Answer: 3

 Watch Video Solution

7. If the focal length of the objective and eye lens are 1.2 cm and 3 cm respectively and the object is put 1.25 cm away from the objective lens and the final image is formed at the infinity. The magnifying power of the microscope is

A. 150

B. 200

C. 250

D. 400

Answer: 2

Watch Video Solution

8. The length of the compound microscope is 14 cm. The magnifying power for relaxed eye is 25. If the local of the eye lens is 5 cm, then the object distance for objective lens would be

A. $\frac{59}{25}cm, \frac{59}{31}cm$

B. $\frac{59}{31}cm, \frac{59}{25}cm$

C. $3cm, 2cm$

D. $4cm, 1cm$

Answer: 1

Watch Video Solution

9. The focal length of objective and eye lens of a microscope are 4 cm and 8 cm respectively. If the least distance of distinct vision is 24 cm

and object distance is 4.5 cm from the objective lens, then the magnifying power of the microscope will be

A. 18

B. 32

C. 64

D. 20

Answer: 2

Watch Video Solution

10. In a compound microscope, the objective lens and eyepiece have a focal length of 0.95 cm and 5 cm respectively and are kept at a distance of 20 cm. If the last image is formed at a distance of 25 cm from the eyepiece. Calculated magnifying power.

A. $\frac{95}{94} cm, 94$

B. $\frac{94}{95} cm, 95$

C. $0.94 cm, 94$

D. $0.95 cm, 95$

Answer: 1

Watch Video Solution

11. In a compound microscope, the focal length of two lenses are $1.5cm$ and $6.25cm$. If an object is placed is $2cm$ from objective and the final image is formed at $25cm$ from eye len., the distance between the two lensese is

A. 6

B. 7.75

C. 9.25

D. 11

Answer: 4

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12. The length of the compound microscope is 14 cm. The magnifying power for relaxed eye is 25. If the local of the eye lens is 5 cm, then the object distance for objective lens would be

A. 1.8

B. 1.5

C. 2.1

D. 2.4

Answer: 1

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13. The focal lengths of the objective and the eyepiece of a compound microscope are 2.0cm and 3.0cm, respectively. The distance between

the objective and the eyepiece is 15.0cm. Th final image formed by the eyepiece is at infinity. The two lenses are thin. The distance, in cm, of the object and the image produced by the objective, mesured from the objective lens, are respectively.

A. $2.4 \quad \text{and} \quad 12$

B. $2.4 \quad \text{and} \quad 15$

C. $2.3 \quad \text{and} \quad 3$

D. $2 \quad \text{and} \quad 12$

Answer: 1

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14. The objective and eye piece of an astronomical telescope are double convexlenses with refractive jndex 1.5. When the telescope is adjusted to infinity the seperation between the lenses is 16 cm. If the space between the lenses is now filled with water and again telescope is adjusted for infinity. Then the present separation between the lenses is

A. $8cm$

B. $16cm$

C. $24cm$

D. $32cm$

Answer: 4

Watch Video Solution

15. The focal length of the lensese of an astronomical telescope are 50 cm and 5 cm. The length of the telescope when the image is

formed at the least distance of distinct vision is

A. 45

B. 55

C. $\frac{275}{6}$

D. $\frac{325}{6}$

Answer: 4

Watch Video Solution

16. An astronomical telescope of tenfold angular magnification has a length of 44 cm. The focal length of the objective is

A. $4cm$

B. $40cm$

C. $44cm$

D. $440cm$

Answer: 2

Watch Video Solution

17. The two lenses of a compound microscope are of focal lengths 2 cm and 5 cm. If an object is placed at a distance of 2.1 cm from the objective of focal length 2 cm the final image forms at the final image forms at the least distance of distinct vision of a normal eye. Find the magnifying power of the microscope.

A. 20

B. 6

C. 120

D. 60

Answer: 3

Watch Video Solution

18. The magnification produced by the objective lens of a compound microscope is 25. The focal length of eye piece is 5 cm and it forms find image at least distance of distinct vision. The magnifying power of the compound microscope is

A. 19

B. 31

C. 150

D. $\sqrt{150}$

Answer: 3

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19. The focal length of a convex lens is 10 cm. Find its magnifying power when it is used as a

magnifying glass to form the image at (i) near point and (ii) far point.

A. $3.5, 2.5$

B. $2.5, 3.5$

C. $2.5, 1.5$

D. $1.5, 2.5$

Answer: 1

Watch Video Solution

20. A magnifying glass is made of a combination of a convergent lens of power 20D and and divergent lens of power 4D. If the least distance of distinct vision is 25cm. The magnifying power is

A. 7

B. 5

C. 3

D. 8

Answer: 1

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21. The focal length of objective and eyelens of a astronomical telescope are respectively 20 cm and 5 cm. Final image is formed at least distance of distinct vision. The magnifying power will be

A. -4.8

B. -4.0

C. 4.8

D. 4.0

Answer: 1

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Practice Sheet Exercise I Optical Instruments Level I Main Straight Objective Type Questions

1. A convergent lens of power 16D is used as a simple microscope. The magnification

produced by the lens, when the final image is formed at least distance of distinct vision is

A. 6

B. 4

C. 7

D. 5

Answer: 4

Watch Video Solution

2. The maximum magnification that can be obtained with a convex lens of focal length 2.5 cm is (the least distance of distinct vision is 25 cm):

A. 10

B. 0.1

C. 62.5

D. 11

Answer: 4

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3. The objective lens of a compound microscope produces magnification of 10. In order to get an over all magnification of 100 when image is formed at 25 cm from the eye, the focal length of the eye lense should be (in cm)

A. 4

B. 10

C. $\frac{25}{9}$

D. 9

Answer: 3

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4. Four lenses A, B, C and D of power $+100D$, $-50D$, 20 D and $5D$. Which lerses will you use to design a compound microscope for best magnification ?

A. A and C

B. B and D

C. C and D

D. A and B

Answer: 1

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5. A microscope consists of two convex lenses of focal lengths 2.0 cm and 6.25 cm placed 15.0 cm apart. Where must the object be placed so

that the final virtual image is at a distance of 25 cm from the eye ?

A. $2.5cm$

B. $2cm$

C. $1.5cm$

D. $3cm$

Answer: 1

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6. The two lenses of a compound microscope are of focal lengths 2 cm and 5 cm. If an object is placed at a distance of 2.1 cm from the objective of focal length 2 cm the final image forms at the least distance of distinct vision of a normal eye. Find the distance between the objective and eyepiece

A. $46.17cm$

B. $42cm$

C. $4.17cm$

D. $40cm$

Answer: 1

Watch Video Solution

7. The magnifying power of an astronomical telescope for normal adjustment is 10 and the length of the telescope is 110cm..Find the magnifying power of the telescope when the image is formed at the least distance of distinct vision for normal eye.

A. 14

B. 48

C. 28

D. 52

Answer: 1

Watch Video Solution

8. A telescope, consisting of an objective of focal length 60 cm and a single eye lens of focal length 15 cm is focused on a distant

object in such a way that parallel rays comes out from the eye lens. If the object subtends an angle 2^{o} at the objective, the angular width of Che image is

A. 10^{0}

B. 8^{0}

C. 5^{0}

D. $1/6^{0}$

Answer: 2

Watch Video Solution

9. An astronimical telescope has an angular magnification of magnitude 5 for distant objects. The separation between the objective and the eye-piece is 36 cm and the final image is formed at infinity. The focal length f_0 of the objective and the focal length f_0 of eye-pieces are

A. $f_0 = 45cm, f_e = -9cm$

B. $f_0 = 7.2cm, f = 5cm$

C. $f_0 = 50cm, f_e = 10cm$

D. $f_0 = 30cm, f_e = 6cm$

Answer: 4

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10. If tube length Of astronomical telescope is 105cm and magnifying power is 20 for normal setting, the focal length of the objective is:

A. $100cm$

B. $10cm$

C. $20cm$

D. $25cm$

Answer: 1

Watch Video Solution

11. The focal lengths of the eyepiece and the objective of an astronomical telescope are 2 cm and 100 cm respectively. Find the magnifying" power of the telescope for normal adjustment and the length of the telescope.

A. $50, 102cm$

B. $100, 204cm$

C. $25, 62cm$

D. $75, 125cm$

Answer: 1

Watch Video Solution

12. A converging lens of 2.5cm focal length is used as a simple microscope producing virtual

image at 25cm from the eye. The position of the object from the lens is (nearly)

A. $1cm$

B. $2cm$

C. $2.2cm$

D. $4cm$

Answer: 3

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13. A compound microscope is of magnifying power 100". The magnifying power of its eyepiece is 4. Find the magnification of its objective

A. 25

B. 20

C. 15

D. 30

Answer: 1

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14. The minimum magnifying power of a telescope is M. If focal length of its eye lens is halved, the magnifying power will become

A. M

B. 2M

C. 3M

D. 4M

Answer: 2

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15. The magnifying power of an astronomical telescope for relaxed vision is 16 and the distance between the objective and eyelens is 34 cm. Then the focal length of objective and eyelens will be respectively

A. $17cm, 17cm$

B. $20cm, 14cm$

C. $32cm, 2cm$

D. $30cm, 4cm$

Answer: 3

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16. The focal length of objective and the eyepiece of a compound microscope are 1cm and 5cm. An object is placed at a distance of 1.1 cm from the objective and if the final image is formed at infinity the magnifying power and distance between the lenses are respectively

A. $60, 16cm$

B. $50, 16cm$

C. $50, 15.7cm$

D. $60, 16.7cm$

Answer: 2

Watch Video Solution

17. The magnifying power of an astronomical telescope is 8 and the distance between the two lenses is 54 cm. The focal length of eye lens and objective will be respectively.

A. $48cm, 6cm$

B. $8cm, 64cm$

C. $64cm, 8cm$

D. $6cm, 48cm$

Answer: 4

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18. The focal length of the objective of a terrestical telescope is 80cm and it is adjusted for parallel rays, then its power is 20. If the

focal length of erecting lens is 20cm, then full length of the telescope will be

A. 84

B. 100

C. 124

D. 164

Answer: 4

Watch Video Solution

19. A person cannot see objects clearly beyond 50.cm. The power of lens to correct the vision

A. $+5D$

B. $-0.5D$

C. $-2D$

D. $+2D$

Answer: 3

Watch Video Solution

20. A person with a defective sight is using a lens having a power of $+2D$. The lens he is using is

A. Concave lens of focal length0.5 m

B. Convex lens of focal length 2.0 m

C. Concave lens with focal length 2.0 m

D. Convexlens with focal length 0.5 m

Answer: 4

Watch Video Solution

21. A person wears glases of power -2.5 D. The defect of the eye and far point of the person without glasses are respectively

A. farsightness 40 cm

B. nearsightness 40 cm

C. nearsightness 250 cm

D. astigmatism 40 cm

Answer: 2

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Example

1. If the focal length of a magnifier is 5 cm, calculate

(a) the power of the lens

(b) the magnifying power of the lens for relaxed and strained eye.

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2. A man with normal near point (25 cm) reads a book with small print using a magnifying

glass : a thin convex lens of focal length $5cm$. What are the closest and the farthest distances at which he can read the book when viewing through the magnifying glass ?

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3. In a compound microscope, the object is 1 cm from the objective lens. The lenses are 30 cm apart and the intermediate image is 5 cm from the eye-piece. What magnification is produced?

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4. A compound microscope has an objective of focal length 2cm and an eye-piece of focal length 5 cm. If an object is placed at a distance of 2.4 cm in front of the field lens, find the magnifying power of the instrument and length of the tube if

(a) final image is at infinity

(b) final image is at least distance of distinct vision (=25cm).

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5. An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and eyepiece is $36cm$ and the final image is formed at infinity. Determine the focal length of objective and eyepiece.

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6. A telescope has an objective of focal length $50cm$ and an eyepiece of focal length $5cm$.

The least distance of distinct vision is $25cm$. The telescope is focused for distinct vision on a scale $2m$ away from the objective. Calculate (a) magnification produced and (b) separation between objective and eyepiece.

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7. The near and far poit sof a person are t 40 cm and 250 cm respectively. Find the power of thlens he /she should use while reading at 25

cm. with this lens on the eye, what maxmum distance is cleary visible?

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8. A young boy can adjust the power of his eye lens between 50 D and 60 D. His far point is infinity. A. What is the distance of his retina from the eye-lens? b. What is the near point?

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Exercise Long Answer Questions

1. Write short note on the eye.

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2. (a) Draw a ray diagram showing the image formation by a compound microscope. Hence obtain expression for total magnification when the image is formed at infinity.

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3. Explain the construction and working of an astronomical telescope. Calculate its magnifying power when the image is formed at the least distance of distinct vision.

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Exercise Short Answer Questions

1. What is meant by power of accommodation of the eye?

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2. Write about different type of defects in vision. How can we minimize that defects.

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3. Draw a neat labelled ray diagram showing the formation of an image at the least distance of distinct vision D by a simple microscope. When the final image is at D,

derive an expression for its magnifying power at D.

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4. The angle subtended at the eye by an object is equal to the angle subtended at the eye by the virtual image produced by a simple microscope. In what sense, does a simple microscope produce angular magnification?

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5. Magnifying power of a microscope is inversely proportional to the focal length of the lens. What then stops us from using a convex lens of smaller and smaller focal length and achieving greater and greater magnifying power?

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6. An object is first seen in red light and then in blue light through a microscope. In which case is the magnifying power greater? Explain.

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7. Distinguish between a microscope and a telescope.

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8. How will the magnifying power of an Astronomical telescope be affected on increasing

(i) the focal length and

(ii) the aperture of its objective

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9. Draw a ray diagram of a reflecting type telescope. State two advantages of this telescope over a refracting telescope.

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10. Advantages of cassegrain telescope is/are

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Exercise Very Short Answer Questions

1. What is visual angle? What is its value for an object which is at infinity?

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2. What is the nature of the image formed by a convex mirror?

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3. Two streamlines cannot cross each other. Why?

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4. A person looking at a net of crossed wires is able to see the vertical direction more distinctly than the horizontal wires. What is the defect due to? How is such defect of vision corrected?

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5. Define magnifying power of a microscope in terms of visual angle.

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6. In case of a simple magnifier of focal length 'f' what are the maximum and minimum distances of (a) object and (b) its image from the lens if least distance of distinct vision is D?

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7. What change in magnifying power of a microscope do you expect if:

(a) object is moved closer to field lens (between F and 2F)

(b) the length of tube is decreased (c) objective and eyepiece are interchanged.

(d) eye is not close to eyepiece (e) white light is replaced by red light?

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8. How will the magnifying power m be affected if field and eye lens are interchanged in

(a) microscope , (b) telescope?

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9. The aperture of the objective lens of a telescope is made large so as to

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10. Can the image formed by a simple microscope be projected on a screen without using any additional lens or mirror?

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11. The angular magnification of a system is less than one. Does it mean that the image formed is inverted?

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12. A simple microscope using a single lens often shows coloured image of a white source. Why?

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13. A person is viewing an extended object. If a converging lens is placed in front of his eyes, will he feel that the size has increased?

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14. The magnifying power of a converging lens used as a simple microscope is $\left(1+\frac{D}{f}\right)$. A compound microscope is a combination of two such converging lenses. Why don't we have magnifying power $\left(1+\frac{D}{f_0}\right)\left(1+\frac{D}{f_e}\right)$. In other words, why can the objective not be treated as a simple microscope but the eyepiece can?

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15. In microscope, write the effect of wavelength of light on magnifying power.

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16. Why are the magnification properties of microscopes and telescopes defined in terms of the ratio of angles and not in terms of the ratio of sizes of objects and images?

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17. What is the position of the object relative to the objective of a compound microscope? Where is its image formed?

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18. What is normal adjustment of a telescope? In what way it is better?

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19. Two lenses of focal lengths 5 cm and 50 cm are to be used for making a telescope. Which will you use for the objective?

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20. Name the telescope which having concave lens as eyepiece.

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21. Write the nature of the final image in

(i) Simple microscope

(ii) Compound microscope

(iii) Astronomical telescope

(iv) Galilean telescope

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22. Write two advantages of a reflecting telescope over a refracting telescope.

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Problems Level I

1. A 4 diopter lens is used as a magnifier. Where should the object be placed to obtain maximum angular magnification for normal eye?

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2. A philatelist examines the printing details on a stamp using a convex lens of focal length

10.0 cm as a simple magnifier. The lens is held close to the eye and the lens to object distance is adjusted so that the virtual image is formed at the normal near point (25 cm). Calculate magnification.

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3. The focal length of a convex lens is 10 cm. Find its magnifying power when it is used as a magnifying glass to form the image at (i) near point and (ii) far point.

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4. A microscope consists of two convex lenses of focal lengths 2.0 cm and 6.25 cm placed 15.0 cm apart. Where must the object be placed so that the final virtual image is at a distance of 25 cm from the eye ?

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5. A compound microscope is of magnifying power 100". The magnifying power of its

eyepiece is 4. Find the magnification of its objective

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6. An angualar magnification (magnfiying power) of $30X$ is desired using an objective of focal length $1.25cm$ and eye-piece length $5cm$. How will you set up the compound microscope for normal adjustment (Final image at ∞)?

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7. The objective of a small telescope has focal length 120 cm and diameter 5 cm. The focal length of the eyepiece is 2 cm. What is the magnifying power and length of tube for distant objects and relaxed eye?

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8. The focal lengths of the eyepiece and the objective of an astronomical telescope are 2 cm and 100 cm respectively. Find the

magnifying" power of the telescope for normal adjustment and the length of the telescope.

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9. A telescope uses lenses of focal lengths 75 cm and 5 cm. Calculate the minimum and maximum magnifying power which can be achieved with the instrument.

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10. The magnifying power of an astronomical telescope for normal adjustment is 10 and the length of the telescope is 110cm..Find the magnifying power of the telescope when the image is formed at the least distance of distinct vision for normal eye.

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11. An astronimical telescope is to be designed to have a magnifying power of 50 in normal

adjustment. If the length of the tube is 102 cm, find the powers of the objective and the eyepiece.

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Problems Level Ii

1. A normal eye has retina 2 cm behind the eye-lens. What is the power of the eye-lens when the eye is (a) fully relaxed, (b) most strained?

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2. The near point and the far point of a child are at 10 cm and 100 cm. If the retina is 2.0 cm behind the eye-lens, what is the range of the power of the eye-lens?

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3. A far sighted person cannot see object clearly al a distance less than 75 cm from his eyes. The power of the lens needed to read an object al 25 cm is

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4. A person cannot see objects clearly 40 cm from him. Can you help him by telling the nature and focal length of lens which he must use to make his eye normal?

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5. A compound microphone has an objective of focal length 1 cm and an eyepiece of focal

length 2.5 cm. An object has to be placed at a distance of 1.2 cm away from the objective for normal adjustment. a.Find the angular magnification. b.Find the length of the microscope tube.

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6. The focal lengths of the objective and eyepiece of a microscope are 0.6 cm and 5 cm respectively and the distance between them is 12 cm. Find the distance of the object from the

objective when the final image seen by the eye is 25 cm from the eye-piece. Also find the magnifying power.

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7. The two lenses of a compound microscope are of focal lengths 2 cm and 5 cm. If an object is placed at a distance of 2.1 cm from the objective of focal length 2 cm the final image forms at the final image forms at the least

distance of distinct vision of a normal eye. Find the magnifying power of the microscope.

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8. The focal length of the objective and eyepiece of a telescope are 60 cm and 5 cm respectively. The telescope is focused on an object 360 cm from the objective and the final image is formed at a distance of 30 cm from the eye of the observer. Calculate the length of the telescope.

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9. A gaint refracting telescope at an observatory has an objective lens of focal length 15m. If an eye piece of focal length 1.0 cm is used, what is the angular magnification of the telescope ?

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