



PHYSICS

BOOKS - CHHAYA PHYSICS (BENGALI ENGLISH)

OPTICAL INSTRUMENTS

Example

1. A person having long sight cannot see things distinctly at a distance less than 40 cm . If he

wants to see things situated at 25 cm from him, what should be the power of his spectacles ?



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2. A short-sighted person can see distinctly the object situated at a distance of 20 cm from him. What type of lens will he use to see the objects situated at a distance of 100 cm from him ? What will be the power of the lens ?



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3. A short-sighted person can read a book only up to 15 cm from his eyes. To read a book placed at a distance of 25 cm from him what type of spectacles should he use? What be the power of the spectacles?



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4. A person can see distinctly up to a distance of 2 m and no further. To see distinctly up to a long distance what type of spectacles should

he use? What will be the power of the lens of the spectacles?



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5. A person with spectacles of power $3m^{-1}$ can see distinctly the letters of newspaper placed at a distance of 25 cm from the eye. At what distance should the newspaper be kept to be able to read it without spectacles?



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6. A person can see distinctly any object situated in between the distance 50 cm and 300 cm. what type of spectacles are to used (i) to extend the far point up to infinity and



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7. A person can see distinctly any object situated in between the distance 50 cm and 300 cm. what type of spectacles are to used (ii) to bring the least distance of distinct vision at

25 cm ? What will be the ranges of distinct vision in each pair of spectacles?



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8. A person using spectacles having power $+2.5m^{-1}$ can see the objects distinctly at a distance of 25 cm . What is the near point for the person ? What type of defect of vision does the eye have ?



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9. A person with defective eyes can see the objects distinctly up to the distance 20 cm . What type of lens should be used and of what power?



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10. A boy can clearly see objects between distance 15 cm to 200 cm from his eye . To clearly see an object situated at infinity , what will be the power of the lens that should he use? If he wears that lens then what will be

the least distance of distinct vision in that case?



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11. A long -sighted man can clearly see at any distance beyond 2.5 m . What kind of lens in his spectacles does require to read books placed 25 cm from his eyes?



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12. If an object is placed at a distance of 5 cm from a convex lens, a real image of the object is formed at a distance of 20 cm from the lens . If the lens is used as a magnifying glass what maximum magnification can be obtained from it ? Least distance of distinct vision is 24 cm .



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13. A watch repairer kept a magnifying glass very close to his eyes and found that the

magnifying power of the glass was 8. if the least distance of distinct vision of the eye is 25 cm , calculate the focal length of the lens .



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14. A convex lens of power $10m^{-1}$ is used as a simple magnifying glass . What are the maximum and minimum magnification of the lens ?



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15. The focal lengths of objective and eyepiece of a compound microscope are 0.5 cm and 1.5 cm respectively . If the least distance of distinct vision is 25 cm and magnification is 500 then what is the distance between objective and eyepiece?



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16. The focal lengths of the two lenses of a compound microscope are 0.5 cm and 1 cm respectively . An object is placed at a distance

of 1 cm from the objective. If the final image of the object is formed at a distance of 25 cm from the eye , what is the distance between the two lenses and the magnifying power of the microscope ?



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17. The focal lengths of the objective and the eyepiece are 1 cm and 4 cm respectively . The distance between them is 14.5 cm . If an object of height 1mm is placed at a distance of 1.1 cm

from the objective what will be the position and the size of the image seen through the microscope?



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18. The focal lengths of the objective and the eyepiece of a compound microscope are 1 cm and 5 cm respectively and the distance between the centres of the lenses is 15 cm . If the final image is formed at the least distance

of distinct vision , what is the magnifying power of the microscope ?



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19. The focal lengths of the objective and the eyepiece of a compound microscope are 1 cm and 2 cm respectively and the distance between them is 12 cm . If the least distance of distinct vision of the observer is 25 cm , what should a small object distance be placed to see it ?



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20. An object is placed at a distance of 5 cm from the objective of a compound microscope . If the final image is formed at the least distance of distinct vision and coincides with the object then calculate the focal lengths of the objective and the eyepiece . given that the least distance of distinct vision = 25 cm and the magnifying power of the instrument = 15 cm.



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21. The focal lengths of the eyepiece and the objective are 10 cm and 200 cm respectively . If someone wants to observe moon with naked eye through this telescope then what should be the distance between the objective and the eyepiece ?



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22. The lengths of the tube of an astronomical telescope is 44 cm and its angular

magnification is 10 . What is the focal length of its objective ?



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23. A small astronomical telescope has an objective of focal length 50 cm and an eyepiece of focal length 5 cm . It is focussed at the sun and the final image is formed at a distance of 25 cm from the eyepiece . If the diameter of the sun subtends an angle of $32'$ at the centre of the objective calculate the

angular magnification of the instrument and the actual size of the image.



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24. If the focal lengths of the objective and the eyepiece of an astronomical telescope be 100 cm and 20 cm respectively , calculate the angular magnification of the instrument . If a house of height 60 m situated at a distance of 1 km be observed by the instrument determine

the height of the image formed by the objective.



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25. Distance between the earth and the moon is 386242.56 km and diameter of the moon is 3218.69 km. if focal length of the objective of a telescope is 0.018288 km then what is the diameter of real image of the moon formed by the objective ?



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26. The focal lengths of the objective and the eyepiece of a compound microscope are 2m and 5 cm respectively. The distance between the two lenses is 20 cm . Final image is formed at 25 cm distance from the objective calculate the distance between eyepiece and final image.



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Section Related Questions

1. What is the difference between visual axis and optic axis?



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2. What do you mean by accommodation of eye?



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3. What is range of vision ?





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4. What do you mean by near point and far point of an eye?



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5. What do you mean by adaptation of eye?



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1. What will happen to the image if one half of the objective lens is covered with a black paper ?



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2. The radius of the sun is about 10^6 km yet it looks like a disc why?



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3. Explain how you can identify a telescope and a microscope from their appearance.



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4. Why is the diameter of the objective of an astronomical telescope made large?



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5. Though the lamp posts on a road are of the same height, the distant posts appear shorter

-explain the reason.



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6. For making a telescope two lenses of focal lengths 5 cm and 50 cm are to be used . Which lens will you use for objective ?



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7. Which of the following lenses L_1 , L_2 , and L_3 will you select to construct a

best possible (i) telescope , (ii) microscope ?

Which of the selected lenses is to be used as

objective and eyepiece in each case ?

Lenses	Power	Aperture
--------	-------	----------

L_1	$6D$	$1cm$
-------	------	-------

L_2	$3D$	$8cm$
-------	------	-------

L_3	$10D$	$1cm$
-------	-------	-------



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L_3	$10D$	$1cm$
-------	-------	-------



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9. Can we consider spectacles as visual instrument?



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10. In which telescope the final image is erect ?



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11. What do you mean by binocular vision ?



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12. What is the main difference between a Galilean telescope and a simple terrestrial telescope ?



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13. What do you mean by resolving power of an optical instrument ? How does resolving power of a telescope depend on wavelength of light and diameter of objective lens ?



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Ncert Textbook Questions With Answer Hint

1. The focal lengths of the objective and eyepiece of a compound microscope are 8mm and 2.5 cm respectively . A man with normal

near point (25 cm) can focus distinctly the microscope . What is the separation between the lenses and magnification power of the instrument ?



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2. A giant refracting telescope at an observatory has an objective lens of focal length 15 cm . If an eyepiece of focal length 1.0 cm is used, find the angular magnification on the telescope .



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3. If focal length of 15 m telescope is used to view the moon, what is the diameter of the image of the moon formed by the objective lens ? The diameter of moon is $3.48 \times 10^6 \text{ m}$ and the radius of lunar orbit is $3.8 \times 10^8 \text{ m}$.



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4. For a normal eye , the far point is at infinity and the near point of vision is about 25 cm .

The cornea of the eye provides a converging power of about 40 D and the least converging power of the eye lens behind the cornea is about 20 D . From this rough data estimate the range of accommodation (i.e the range of converging power of the eye lens) of a normal eye .



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

glass of focal length 5 cm .

(a) What is the closest and farthest distance at which he can read the book when viewing through the magnifying glass ?



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6. A man with normal near point (25 cm) reads a book with small print using a magnifying glass of focal length 5 cm .

(b) What is the maximum and minimum

angular magnification (magnifying power)

possible using the above simple microscope ?



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7. When viewing through a compound microscope , our eyes should be positioned not on the eyepiece but a short distance away from it for best viewing . Why ? How much should be the short distance between the eye and the eyepiece ?



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8. In viewing through a magnifying glass , one usually positions one' s eyes very close to the lens . Does angular magnification change if the eye is moved back ?



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Ncert Exemplar Questions With Answer Hint

1. A magnifying glass is used , as the object to be viewed can be brought closer to the eye

than the normal near point. This results in

- A. a larger angle to be subtended by the object at the eye and hence viewed in greater details
- B. the formation of a virtual erect image
- C. increase in the field of view
- D. infinite magnification at the near point

Answer: A::B



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2. An astronomical refractive telescope has an objective of focal length 20 m and an eyepiece of focal length 2 cm .

A. The length of the telescope tube is 20.02 m

B. The magnification is 1000

C. The image formed is inverted

D. An objective of a larger aperture will increase the brightness and reduce chromatic aberration of the image

Answer: A::B::C



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Exercise Multiple Choice Questions

1. Normal eye cannot see the object nearby from a distance of 25 cm , as

A. focal length of the eye is 25 cm

B. distance between the eye lens and the retina is 25 cm

C. the eye is unable to adjust the distance between the lens and the retina below a certain limit

D. the eye is unable to adjust the focal length of the eye lens below a certain limit

Answer: D



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2. Ability of the eye to see objects at all distances is called

A. binocular vision

B. myopia

C. hypermetropia

D. accomodation

Answer: D



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3. The numerical aperture for a human eye is of the order of

A. 1

B. 0.1

C. 0.01

D. 0.001

Answer: D



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4. If there had been one eye of the man then

A. image of the object would have been

inverted

B. visible region would have decreased

C. image would have not been seen three

dimensional

D. B and C both

Answer: D



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5. What type of lens should be used in spectacles for the remedy of myopia ?

A. concave lens whose focal length is equal to the distance of the far point of the defective eye from the lens

B. convex lens whose focal length is equal to the distance of the far point of the defective eye from the lens

C. concave lens whose focal length is equal to the distance of the near point of the defective eye from the lens

D. convex lens whose focal length is equal to the distance of the near point of the defective eye from the lens

Answer: A



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6. A person who can see things most clearly at a distance of 10 cm , requires spectacles to be able to see clearly things at a distance of 30 cm . What should be the focal length of the spectacles ?

A. 15 cm (concave)

B. 15 cm (convex)

C. 10 cm

D. zero

Answer: A



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7. The least distance of distinct vision of a man is 45 cm. He uses a lens of focal length 15 cm for reading . The magnification which he gets

A. 4

B. 3

C. 2

D. 1

Answer: A



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8. The image formed by the objective of a compound microscope is

- A. virtual and magnified
- B. virtual and diminished
- C. real and diminished
- D. real and magnified

Answer: D



9. To get a magnification from a compound microscope ,

A. the focal length of the objective should be large while the focal length of the eyepiece should be small .

B. the focal length of the objective should be small while focal length of the eyepiece should be large

C. both of the focal lengths of the objective and the eyepiece should be large

D. both of the focal lengths of the objective and the eyepiece should be small

Answer: D



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10. The length of the tube a compound microscope is 21.5 cm . The focal lengths of the objective and the eyepiece are 1.6 cm and 2.1

cm respectively . If the final image is situated at infinity , then the distance of the object from the objective is

A. 3 cm

B. 1.7 cm

C. 6 cm

D. 4.8 cm

Answer: B



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11. The angular magnification of a simple microscope can be increased by

A. increasing the focal length of the lens

B. increasing the size of the object

C. increasing the aperture of the lens

D. increasing the power of the lens

Answer: D



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12. The length of the tube of a microscope is 14 cm and its magnifying power for normal eye is 25. The focal length of the eyepiece is 5 cm . The distance of the object from the objective is

A. 2.4 cm

B. 2.5 cm

C. 3.6 cm

D. 1.8 cm

Answer: D



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13. A Galileo's telescope has an objective of focal length 100 cm and magnifying power 50. The distance between the two lenses in normal adjustment is

A. 106 cm

B. 102 cm

C. 92 cm

D. 98 cm

Answer: D



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14. In a Galileo's telescope , the inverted image formed by its objective serves as a virtual object for its eyepiece . If the eyepiece has to form an inverted and magnified image of the virtual object , the eyepiece has to be a concave lens and it must be so placed that the virtual object falls

A. within F

B. between F and $2F$

C. at $2F$

D. beyond $2F$

Answer: A



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15. In an astronomical telescope, if the focal lengths of the objective and the eyepiece are

f_o and f_e respectively , then the magnification of this instrument is almost

A. $(f_o + f_e)$

B. $(f_o \times f_e)$

C. $\frac{f_o}{f_e}$

D. $\frac{1}{2}(f_o + f_e)$

Answer: C



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16. In case of normal focussing of an astronomical telescope the final image is formed at

- A. focus of the eyepiece
- B. least distance of distinct vision
- C. focus of the objective
- D. infinity

Answer: D



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17. The angular magnification of an astronomical telescope will be maximum, if the focal lengths of the objective the eyepiece are respectively

- A. 1m and 5 cm
- B. 2 m and 6 cm
- C. 3 m and 4 cm
- D. 4m and 3 cm

Answer: D



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18. If the focal length of the eyepiece of a telescope is doubled, its magnifying power m will be

A. $2m$

B. $3m$

C. $\frac{m}{2}$

D. $4m$

Answer: C



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Exercise Very Short Answer Type Questions

1. Give a practical application of persistence of vision .



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2. The impression of a three -dimensional image created by our two eyes is called Fill in the blank.



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3. For a normal eye the least distance of distinct vision is Fill in the blank.



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4. Vision of normal eye ranges from to fill in the blanks.



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5. How can the defect of astigmatism be corrected ?



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6. The minimum distance of distinct vision for a person is 1m . What eye defect does suffer from ?



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7. is the eye -defect which old people usually suffer from fill in the blank .



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8. Cylindrical lens are used as a remedy for ... fill in the blank.



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9. For long -sightedness , lens should be used [fill in the blank].



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10. For short-sightedness , Lens should be used fill in the the blank.



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11. If the least distance of distinct vision is D and focal length of the lens is f then what is the equation for magnification in a simple microscope ?



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12. If the length of the tube of a compound microscope is increased , the magnification increases -Is this statement true or false ?



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13. If the focal length of a microscope is small , magnification is[fill in the blank].



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14. To increase magnification of a compound microscope , the objective and the eyepiece of ... Focal lengths and the microscope tube of Length are to be taken [fill in the blanks] .



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15. In what type of telescope is the final image erect ?



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16. What is used for the objective of a reflecting telescope ?



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17. Write the names of two ordinary types of the telescope.



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18. Is the length of the instrument to be changed if the focal length of the objective of an astronomical telescope is increased ?



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19. In an astronomical telescope , the focal length and the aperture of the objective are and the focal length and the aperture of the eyepiece are taken as compared to those of the objective [fill in the blank].



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20. The final image is an astronomical telescope isandwith respect to the object [fill in the blank] .





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21. The final image in a terrestrial telescope isandwith respect to the object [fill in the blank].



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22. In Galileo's telescope , the objective islens but the eyepiece islens [fill in the blanks] .



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Exercise Short Answer Type Questions I

1. Write two points of difference between astronomical telescope and binocular .



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Problem Set I

1. A shortsighted man can read the writings of a book keeping it at a distance of 15 cm from his eyes. To read the book placed at a distance of 60 cm from his eyes what type of spectacles should he use ? What will be the power of the spectacles ?



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2. A man uses spectacles of a concave lens for his defective eye and can read a book placed

at a distance of 25 cm from him. The focal length of the lens of the spectacles is 50 cm .
At what distance should the book be kept if he wants to read it without spectacles ?



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3. By using the spectacles of a concave lens of power $-5m^{-1}$ a man can read a book keeping it at a distance of 30 cm from his eyes. Without spectacles what is his least distance

of distinct vision ? What is the nature of defect in his eyes ?



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4. A boy can see the objects distinctly only in between 15 cm and 200 cm from his eyes . What should be the power of the lens (in m^{-1} unit) he will use to see the objects at infinity distinctly ? What will the least distance of distinct vision of his eyes with spectacles ?



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5. The near point of a man is at a distance of 200 cm from his eyes. What spectacles should he use in order to read a print 25 cm away from his eyes ?



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6. The far point of a myopic (short-sighted) person is 80 cm in front of the eye. What is the power of the lens required to enable him to see very distant objects clearly.



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7. The near point of a hypermetropic (long - sighted) person is 75 cm from the eye . What is the power of the lens required to enable the person to read clearly a book held at 25 cm from the eye ?



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8. The least distance of distinct vision of a man is 1m . What type of eye defect does he suffer from ?



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9. The focal lengths fo the lens of a simple microscope is 5 cm . If the lens is held near the eyes the image is formed at 25 cm . i.e ., at the least distance of distinct vision. What is the magnifying power of the instrument ?





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10. Two lenses having power $+15m^{-1}$ and $+5m^{-1}$ are placed in contact with each other in an ordinary microscope. If the image is formed at a distance of 25 cm, what is the magnifying power of the instrument ?



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11. Two convex lenses of focal length 1.5 cm and 9 cm are arranged to form a microscope . A small object is placed 1.8 cm from the objective. If the image appears to be 37.5 cm from the eyepiece, what will be the distance between the objective and the eyepiece ?



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12. The focal lengths of the objective and the eyepiece of a compound microscope are 4mm

and 25 mm respectively . The length of the tube of the instrument is 16 cm . If the final image is formed at infinity and the least distance of distinct vision is 25 cm , determine the magnifying power of the instrument .



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13. The focal lengths of the objective and the eyepiece of a compound microscope are 2 cm and 10 cm respectively . At what distance from the objective must an object be placed so that

the final image will be formed at infinity ? The distance between the two lenses is 16 cm .



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14. The focal of the objective and the eyepiece of a compound microscope are 0.5 cm and 1 cm respectively . The distance between the lenses is 16 cm . If the final image is formed at the least distance of distinct vision i.e at 25 cm ,determine the magnifying power of the instrument .



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15. The length of the tube of an astronomical telescope is 80 cm and the magnifying power of the instrument is 19 . Calculate the focal lengths of the objective and the eyepiece.



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16. The magnifying power of an astronomical telescope for normal vision is 10 . The focal length of the objective is 20 cm . What will be

the magnifying power for focussing the final image formed at a distance of 25 cm from the eyepiece ?



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Problem Set II

1. The focal lengths of the objective and the eyepiece of a compound microscope are 1 cm 5 cm respectively. If an object is placed at a distance of 1.1cm from the objective the final

image is formed at a distance of 25 cm from the eyes. Determine the magnification and the distance between the lenses.



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2. Thin converging lenses of focal lengths 2 cm and 10 cm are used respectively as the objective and the eyepiece of a microscope. The distance between the optical centre of the lenses is 26 cm . If an object is placed at a distance of 2.25 cm from the objective , find

the position and magnification of the final image.



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3. If in compound microscope m_1 and m_2 be the linear magnification of the objective lens and eye lens respectively, then what is the magnifying power of the microscope ?



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4. The focal lengths of the objective and the eyepiece of an astronomical telescope are 20 cm and 1 cm . If the instrument is focused for infinity and focused for distinct vision what will be the magnifying power ? What will be the length of the tube of the instrument in each case ?



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5. To observe terrestrial bodies the angular magnification of a telescope is 5 . The distance between the objective and the eyepiece is 36 cm and the final image is formed at infinity . Determine the focal lengths of the objective lens and eyepiece lens.



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6. A simple telescope , consisting of an objective of focal length 60 cm and a single

eye lens of focal length 5 cm is focussed on a distant object in such a way that parallel rays come out from the eye lens. If the object subtends an angle 2° at the objective, what is the angular width of the image ?



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Problem Set Ii Hots Numerical Problems

1. A real image of an object is formed on a screen at a distance of 50 cm from a convex

lens . A person holds his spectacles in between the screen and the convex lens at a distance of 5 cm from the lens . If the screen is moved 15 cm towards the lens again a real image is formed , what is the focal length of the spectacles ? what is the nature of defect of his vision ?



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2. The focal lengths of the eyepiece and the objective of a microscope are 0.3 m and 0.4

and the distance between them is 0.2m . The position of the eyepiece and the objective are so interchanged that the angular magnification of the instrument remains unchanged. What is the new distance between the two lenses ?



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3. A microscope has an objective of focal length 1 cm and an eyepiece of focal length 4 cm . The distance between the lenses is 14.5

cm . An object of height 1mm is placed at a distance of 1.1 cm from the objective . Determine the position and size of the image seen through the microscope.



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4. The focal lengths of the objective and the eyepiece of a terrestrial telescope are 180 cm and 5 cm respectively. The focal length of the erecting lens is 3.5 cm. what is the distance between the objective and the eyepiece ? what

is its magnifying power ? Can it be used for the purpose of astronomy ?



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5. The focal lengths of the lenses of the objective and eyepiece of a microscope are 2 cm and 5 cm respectively. The distance between them is 20 cm . At what distance from the objective should the object be placed so that the final image is formed 25 cm from the eyepiece ? what will be the magnification ?



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6. A telescope has an objective lens of focal length 200 cm and an eyepiece with focal length 2 cm . If this telescope is used to see 50 meter tall building at a distance of 2 km, what is the height of the image of the building formed by the objective lens ?



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7. The diameter of the objective of a telescope is 10 cm . The telescope is situated at a distance of 1 km from two objective . If average wave length of the light is 5000\AA , then to resolve these two object, what will be the minimum distance between the two ?



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8. The lengths of a compound telescope is 21.5 cm . The focal lengths of its objective and

eyepiece are 1.6 cm and 2.1 cm respectively . If the final image is formed at a distance of 22.45 cm from the eyepiece , then calculate the distance of the object from the objective.



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Entrance Corner Assertion Reason Type

1. Direction : These questions have statement I and statement II. of the four choice given below , choose the one that best describes the

two statements.

A: Statement I is true, statement II is true ,
statement II is a correct explanation for
statement I.

B : Statement I is true statement II is true ,
statement II is not a correct explanation for
statement I.

C : statement I is true ,statement II is false.

D: Statement I is false, statement II is true.

Statement I : An observer looks at a tree of
height 15 cm with a telescope of magnifying
power 10. To him the tree appears to be of
height 150 m .

Statement II: Magnifying power of telescope is the ratio of the angle subtended by the image to that subtended by the object .



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2. Direction : These questions have statement I and statement II. of the four choice given below , choose the one that best describes the two statements.

A: Statement I is true, statement II is true , statement II is a correct explanation for

statement I.

B : Statement I is true statement II is true ,
statement II is not a correct explanation for
statement I.

C : statement I is true ,statement II is false.

D: Statement I is false, statement II is true.

Statement I : The resolving power of a
telescope is more if the diameter of the
objective lens is more.

Statement II: Objective lens of large diameter
collects more light.



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1. When we see an object , the image formed on the retina is

A. real

B. virtual

C. erect

D. inverted

Answer: A::D



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2. In which of the following instruments is the final image erect ?

- A. simple microscope
- B. compound microscope
- C. astronomical telescope
- D. galilean telescope

Answer: A::C



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3. Mark the correct options.

A. If the far point increases, the power of the divergent lens should be reduced

B. If the near point increases the power of the convergent lens should be reduced

C. If the far point is 1m away from the eye, divergent lens should be used .

D. If the near point is 1m away from the eye divergent lens should be used.

Answer: C::D



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4. The focal length of the objective of a compound microscope is f_o and its distance from the eyepiece is L . An object is placed at a distance u from the objective. For proper working of the instrument which of the following options are suitable ?

A. $L < u$

B. $L > u$

C. $f_o < L < 2f_o$

D. $L > 2f_o$

Answer: A::D



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5. A magnifying glass of focal length f used to see an object placed at a distance u from it forms the virtual image at the least distance

of distinct vision D. its magnifying power is given by

A. $\frac{D}{f}$

B. $1 - \frac{D}{f}$

C. $\frac{D}{u}$

D. $1 + \frac{D}{f}$

Answer: B::D



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1. A planet is observed by an astronomical reflecting telescope having an objective of focal length 16 m and eyepiece of focal length 2 cm

A. the distance between the objective and eyepiece is 16.02 m

B. the angular magnification of the planet is 800

C. the image of the planet is inverted

D. the objective is larger than eyepiece

Answer: A::B::C::D



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Entrance Corner Comprehension Type

1. A compound microscope has an objective lens of focal length 1 cm and an eyepiece of focal length 2.5 cm .

(i) If a distinct image of an object situated at a

distance of 10.5 cm from the objective is seen ,
the magnification will be

A. 320

B. 280

C. 220

D. 110

Answer: C



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2. A compound microscope has an objective lens of focal length 1 cm and an eyepiece of focal length 2.5 cm .

(ii) Under the above condition the distance between the two lenses will be

A. 21 cm

B. 32 cm

C. 2.27 cm

D. 23.27 cm

Answer: D



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3. A figure divided into squares, each of size 1.0mm^2 is being viewed at a distance of 9.0 cm through a magnifying lens of focal length 10 cm held close to the eye.

(i) The magnification produced by the lens will be

A. 10

B. 5

C. 20

D. 25

Answer: A



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4. A figure divided into squares, each of size 1.0mm^2 is being viewed at a distance of 9.0 cm through a magnifying lens of focal length 10 cm held close to the eye.

(ii) The area of each square in the virtual image is

A. 1.5cm^2

B. 1cm^2

C. 1.8cm^2

D. 2cm^2

Answer: B



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5. A figure divided into squares, each of size 1.0mm^2 is being viewed at a distance of 9.0 cm through a magnifying lens of focal length

10 cm held close to the eye.

(iii) The angular magnification of the lens is equal to

A. 2.5

B. 3.8

C. 3.5

D. 4.2

Answer: C



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6. The focal lengths of the objective and the eyepiece of an astronomical telescope are 140 cm and 5 cm respectively.

The magnifying power of the telescope for viewing objects when the final image is formed at the least distance of distinct vision (25 cm) will be

A. 26.5

B. 30

C. 33.6

D. 40

Answer: C



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7. The focal lengths of the objective and the eyepiece of an astronomical telescope are 140 cm and 5 cm respectively.

(ii) When the telescope is in normal adjustment (i.e the final image is formed at infinity), the magnifying power of the telescope will be

A. 24

B. 28

C. 32

D. 38

Answer: B



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8. The focal lengths of the objective and the eyepiece of an astronomical telescope are 140 cm and 5 cm respectively.

(iii) When the telescope is in normal adjustment , the separation between the objective and the eyepiece will be

A. 120 cm

B. 140 cm

C. 145 cm

D. 150 cm

Answer: C



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Entrance Corner Integer Answer Type

1. An astronomical telescope is adjusted to form the final image at infinity. The separation between the lenses is 80 cm . The angular magnification is 15 . Calculate the focal length of the eyepiece in cm.



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2. A simple microscope with a focal length 5 cm forms an image at the near point of the

eye. Find its magnification.



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Examination Archive With Solutions

1. In an astronomical telescope , focal length of the objective is made

- A. half that of the eyepiece
- B. equal to the eyepiece
- C. shorter than that of the eyepiece

D. greater than that of the eyepiece

Answer: The option D is correct .



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2. Show with the help of a ray diagram how the image is formed in an astronomical telescope .



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3. The magnifying power of a telescope in normal adjustment is 20 , and the focal length of the eyepiece is 5×10^{-2} m. what is the magnifying power obtained when the system is adjusted so that the final image of a distant object is formed 25×10^{-2} m away from the eyepiece?



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4. A person who can see objects clearly at a distance of 10cm , requires spectacles to be able to see clearly objects at a distance of 30 cm. what type of spectacle should he use? Find the focal length of the lens.



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5. Will the magnification increase or decrease if the length of the tube of a compound microscope is increased ? Why ?





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6. The intermediate image formed by the objective of a compound microscope is

A. real , inverted and magnified

B. real, erect and magnified

C. virtual , erect and magnified

D. virtual, inverted and magnified

Answer: The option A is correct.



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7. An observer looks at a distant tree of height 10m with a telescope of magnifying power of 20 . To the observer the tree appears

- A. 10 times taller
- B. 10 times nearer
- C. 20 times taller
- D. 20 times nearer

Answer: The option C is correct.



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8. If the focal length of objective lens is increased then magnifying power of the

A. microscope will increase but that of telescope decrease

B. microscope and telescope both will decrease

C. microscope and telescope both will increase

D. microscope will decrease but that of telescope will increase

Answer:



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9. An astronomical telescope has objective and eyepiece of focal lengths 40 cm and 4 cm respectively. To view an object 200 cm away from the objective and the image is formed at

infinity , the lenses must be separated by a distance

A. 46 cm

B. 50 cm

C. 54 cm

D. 37.3 cm

Answer: The option C is correct.



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10. A person has near point at 60 cm . The focal length of spectacles lenses to read at 22 cm having glasses separated 2 cm from eyes is

A. 40cm

B. 10 cm

C. 20 cm

D. 30 cm

Answer: The option D is correct.



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1. Define the magnifying power of a compound microscope when the final image is formed at infinity . Why must both the objective and the eyepiece of a compound microscope has short focal lengths ? Explain.



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2. Why should the objective of a telescope have large focal length and large aperture?

Justify your answer.



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3. Draw a ray diagram showing the formation of image by a reflecting telescope.



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4. Draw a ray diagram depicting the formation of the image by an astronomical telescope in normal adjustment.



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5. You are given the following three lenses. Which two lenses will you use as eyepiece and as an objective to construct an astronomical telescope? Give reason .

Lenses	Power(D)	Aperture(cm)
L_1	3	8
L_2	6	1
L_3	10	1



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6. Draw a ray diagram for the formation of image by a compound microscope.



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7. You are given the following three lenses. Which two lenses will you use as eyepiece and as an objective to construct a compound microscope ? .

Lenses	Power(D)	Aperture(cm)
L_1	3	8
L_2	6	1
L_3	10	1



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8. Explain two advantages of a reflecting telescope over a refracting telescope.



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