विध्न विचारत भीरु जन, नहीं आरम्भे काम, विपति देख छोड़े तुरंत मध्यम मन कर श्याम।
पुरुष सिंह संकल्प कर, सहते विपति अनेक, 'बना' न छोड़े ध्येय को, रघुबर राखे टेक।।

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EXERCISE–I

Q.1 A distant object is viewed with a relaxed eye with the help of a small Galilean telescope having an objective of focal length 15 cm and an eye piece of focal length 3 cm
(A) The distance between the objective and the eyepiece lens is 12 cm.
(B) The angular magnification of object is 5
(C) Image of the object is erect
(D) The distance between objective and eye piece lens is 18 cm

Q.2 A microscope consists of an objective with a focal length 2 mm and an eye piece with a focal length 40 mm. The distance between the foci (which are between the lenses) of objective and eyepiece is 18 cm. The total magnification of the microscope is(Consider normal adjustment and take D = 25 cm)
(A) 562.5 (B) 625 (C) 265 (D) 62.5

Q.3 A distant object is viewed with a relaxed eye with the help of a small Galilean telescope having an objective of focal length 12 cm and an eyepiece of focal length -3 cm.
(A) The distance between objective and eyepiece lens is 9 cm.
(B) The distance between objective and eyepiece lens is 15 cm.
(C) The image of the object is inverted
(D) The angular magnification of the object is + 4.

Q.4 A Galileo telescope has an objective of focal length 100 cm & magnifying power 50 . The distance between the two lenses in normal adjustment will be
(A) 150 cm (B) 100 cm (C) 98 cm (D) 200 cm

Q.5 Which of the following statement(s) about a simple telescope (astronomical) is/are true
(A) the objective lens forms a real image.
(B) The eyepiece acts as a magnifying glass
(C) the focal length of the objective lens is short
(D) the final image is inverted

Q.6 The separation between the objective and the eye piece of a compound microscope can be adjusted between 9.8 cm to 11.8 cm. Focal length of the objective and the eyepiece are 1.0cm and 6cm respectively. Eyepiece is movable and image is always needed at 24 cm from the eye. D = 24cm. Find the minimum and maximum magnification which can be produced by the microscope.
(A) the minimum magnification is 20 and corresponds to the separation 9.8cm between lenses.
(B) the minimum magnification is 20 and corresponds to the separation 11.8cm between lenses.
(C) the maximum magnification is 30 and corresponds to the separation 9.8cm between lenses.
(D) the maximum magnification is 30 and corresponds to the separation 11.8cm between lenses.

Q.7 An astronomical telescope has an eyepiece of focal-length 5 cm. If the angular magnification in normal adjustment is 10, the distance between the objective and eyepiece in cm is
(A) 110 (B) 55 (C) 50 (D) 45

Q.8 The magnifying power of a telescope in normal adjustment can be increased
(A) by increasing focal lengths of both lenses equally
(B) by fitting eyepiece of high power
(C) by fitting eyepiece of low power
(D) by increasing the distance of object

Q.9 A person with a defective sight is using a lens having a power of +2D. The lens he is using is
(A) concave lens with $f = 0.5$ m (B) convex lens with $f = 2.0$ m
(C) concave lens with $f = 0.2$ m (D) convex lens with $f = 0.5$ m

Q.10 In a compound microscope
(A) the object is held slightly beyond the focal point of the objective.
(B) the image formed by the objective is real.
(C) the image formed by the eye piece is virtual.
(D) none of the above

Q.11 An astronomical telescope has an angular magnification of magnitude 5 for distant objects. The separation between the objective and the eyepiece is 36 cm. The Final image is formed at infinity. The focal length f_o of the objective and f_e of the eyepiece are
(A) 45 cm and – 9 cm respectively (B) 50 cm and 10 cm respectively
(C) 7.2 cm and 5 cm respectively (D) 30 cm and 6 cm respectively

Q.12 An astronomical telescope in normal adjustment receives light from a distant source S. The tube length is now decreased slightly
(A) A virtual image of S will be formed at a finite distance.
(B) No image will be formed
(C) A small, real image of S will be formed behind the eyepiece, close to it.
(D) A large, real image of S will be formed behind the eyepiece, far away from it.

Q.13 In the previous question, if the tube length is increased slightly from its position of normal adjustment
(A) a virtual image of S will be formed at a finite distance
(B) no image will be formed
(C) a small, real image of S will be formed behind the eyepiece, close to it
(D) a large, real image of S will be formed behind the eyepiece, far away from it.

Q.14 In an astronomical telescope in normal adjustment, a straight black line of length L is drawn on the objective lens. The eyepiece forms a real image of this line. The length of this image is l. The magnifying power of the telescope is

(A) $\frac{L}{l}$ (B) $\frac{L}{l} + 1$ (C) $\frac{L}{l} - 1$ (D) $\frac{L+1}{L-1}$

Q.15 An astronomical telescope and a Galilean telescope use identical objective lenses. They have the same magnification, when both are in normal adjustment. The eyepiece of the astronomical telescope has a focal length f.
(A) The tube lengths of the two telescope differ by f.
(B) The tube lengths of the two telescopes differ by 2f.
(C) The Galilean telescope has shorter tube length.
(D) the Galilean telescope has longer tube length.

Q.16 A single converging lens used as a simple microscope. In the position of maximum angular magnification,
(A) the object is placed at the focus of the lens
(B) the object is placed between the lens and its focus
(C) the image is formed at infinity
(D) the object and the image subtend the same angle at the eye.

Q.17 When an astronomical telescope is in normal adjustment, the magnification produced by it M. If this is now turned around with the eyepiece facing a distant object and the eye placed close to the objective, the magnification produced will be

(A) $\frac{1}{M}$ (B) $\frac{1}{M+1}$ (C) $\frac{1}{M-1}$ (D) $\frac{M-1}{M+1}$

Q.18 In a simple microscope, if the final image is located at infinity then its magnifying power is

(A) 25/F (B) 25/D (C) F/25 (D) (1 + 25/F)

Q.19 When length of a microscope tube increases, its magnifying power

(A) decreases (B) increases

(C) does not change (D) may increases or decreases

Q.20 In a compound microscope, the intermediate image is

(A) virtual, erect and magnified (B) real, erect and magnified

(C) real, inverted and magnified (D) virtual, erect and reduced

Q.21 In a reflecting astronomical telescope, if the objective (a spherical mirror) is replaced by a parabolic mirror of the same focal length and aperture, then

(A) The final image will be erect (B) The larger image will be obtained

(C) The telescope will gather more light (D) Spherical aberration will be absent

Q.22 A simple telescope, consisting of an objective of focal length 60 cm and a single eye lens of focal length 5 cm, is focused on a distant object in such a way that parallel rays emerge from the eye lens. If the object subtends an angle of 2° at the objective, the angular width of the image is

(A) 10° (B) 24° (C) 50° (D) 1/6°

Q.23 A man wearing glasses of focal length + 1 m cannot clearly see beyond 1 m :

(A) if he is farsighted (B) if he is nearsighted

(C) if his vision is normal (D) in each of these cases.

Q.24 A man is looking at a small object placed at near point. Without altering the position of his eye or the object, he puts a simple microscope of magnifying power 5X is normal adjustment before his eyes. the angular magnification achieved is :

(A) 5 (B) 2.5 (C) 1 (D) can't see

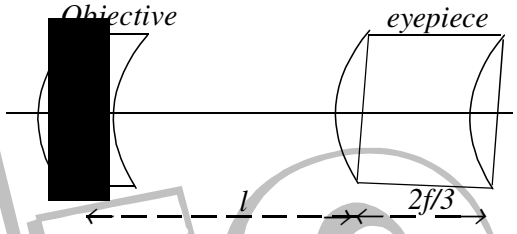
EXERCISE–II

Q.1 The focal length of the objective of a microscope is $F_o = 3$ mm, of the eye- piece $F_e = 5$ cm. An object is at a distance of a = 3.1 mm from the objective. Find the magnification of the microscope for a normal eye, if the final image is 25 cm from the eye. Also find the separation of the lens.

Q.2 A telescope has an objective of focal length one meter and adjustable eyepiece. How much motion must be given to the eye piece to focus an object lying between 5m and infinity. (Adjustment at ∞).

Q.3 An eye can distinguish between two points of an object if they are separated by more than 0.22 mm when the object is placed at 25 cm from the eye .The object is now seen by a compound microscope having 20 D objective and 10 D eyepiece separated by a distance of 20 cm. The final image is formed at 25 cm from the eye. What is the minimum separation between two points d of the objects which can now be distinguished.

Q.4 The objective of an astronomical telescope consists of two thin lenses in contact, of focal lengths +20 cm and – 25 cm respectively. Eyepiece of the same telescope consists of two plano convex lenses each of focal length f separated by 2/3 f as shown in the figure. Find the value of *l* for which final image will be formed at infinity with its angular magnification 100/3. Also find f.



Q.5 A Galilean telescope of angular magnification 10 has the length of 45 cm when adjusted to infinity. The focal length objective is _____ & that of ocular is _____ .

Q.6 A compound microscope is used to enlarge an object kept at a distance 0.03 m from its objective which consists of several convex lenses in contact and has focal length 0.02 m. If a lens of focal length 0.1 m is removed from the objective, find out the distance by which the eyepiece of the microscope must be moved to refocus the image.

Q.7 The focal lengths of the objective and the eyepiece of a compound microscope are 2.0 cm and 3.0 cm respectively. The distance between the objective and the eyepiece is 15.0 cm. The final image formed by the eyepiece is at infinity. Find the distance of object and image produced by the objective, from the objective lens.

Q.8 In a compound microscope the objective and the eyepiece have focal lengths of 0.95 cm and 5 cm respectively, and are kept at a distance of 20 cm. The last image is formed at a distance of 25 cm from the eyepiece. Calculate the position of object and the total magnification.

Q.9 A Galilean telescope consists of an objective of focal length 12 cm and eyepiece of focal length 4 cm. What should be the separation of the two lenses when the virtual image of a distant object is formed at a distance of 24 cm from the eyepiece? What is the magnifying power of telescope under this condition?

Q.10 If the focal length of the objective and eyepiece of a microscope are 2 cm and 5 cm respectively and the distance between them is 20 cm, what is the distance of the object from the objective when the image seen by the eye is 25 cm from eyepiece? Also find the magnifying power.

Q.11 A telescope has an objective of focal length 50 cm and eyepiece of focal length 5 cm. The distance of distinct vision is 25 cm.
The telescope is focussed for distinct vision at near point on an object 200 cm away from the objective. Calculate.
(i) the separation between the objective and eyepiece,
(ii) the angular magnification produced.

Q.12 The eyepiece and objective of a microscope, of focal lengths 0.3 m and 0.4 m respectively, are separated by a distance of 1.2 m. The eyepiece and the objective are to be interchanged such that angular magnification of the instrument remains same in normal adjustment. What is the new separation between the lenses?

Q.13 A 10 D lens is sued as a magnifier. Where should the object be placed to obtain maximum angular magnification for a normal eye (near point = 25 cm)?

Q.14 The separation L between the objective (f = 0.5 cm) and the eyepiece (f = 5 cm) of a compound microscope is 7 cm. Where should a small object be placed so that the eye is least strained to see the image? Find the angular magnification produced by the microscope.

Q.15 A Galilean telescope is constructed by an objective of focal length 50 cm and an eyepiece of focal length 5.0 cm.
(a) Find the tube length and magnifying power when it is used to see an object at large distance in normal adjustment.
(b) If the telescope is to focus an object 2.0 m away from the objective, what should be the tube length and angular magnification, the image again forming at infinity?

Q.16 The image of the moon if focused by a coverging lens of focal length 50 cm on a plane screen. The image is seen by an unaided eye from a distance of 25 cm. Find the angular magnification achieved due to the converging lens.

Q.17 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 his near point ?

Q.18 An object is seen through a simple microscope of focal length 12 cm. Find the angular magnification produced if the image if formed at the near point of the eye which is 25 cm away from it.

Q.19 A small object is placed at a distance of 3.6 cm from a magnifier of focal l length 4.0 cm (a) Find the position of the image. (b) Find the linear magnification (c) Find the angular magnification.

Q.20 A compound microscope consists of an objective of focal length 1.0 cm and an eyepiece of focal , length 5.0 cm separated by 12.2 cm (a) At what distance from the objective should an object be placed to focus it properly so that the final image is formed at the least distance of clear vision (25 cm) ? (b) Calculate the angular magnification in this case.

Q.21 An astronomical telescope has an objective of focal length 200 cm and an eyepiece of focal length 4.0 cm., the telescope is focused to see an object 10 km from the objective. The final image is formed at infinity. Find the length of the tube and the angular magnification produced by the telescope.

Q.22 the near and for points of a person are at 40 cm and 250 cm respectively. Find the power of the lens he /she should use while reading at 25 cm. With this lens on the eye, what maximum distance is clearly visible ?

Q.23 A simple microscope is rated 5 X for a normal relaxed eye. What will be its magnifying power for a relaxed farsighted eye whose near point is 40 cm ?

Q.24 Find the maximum magnifying power of a compound microscope having a 25 diopter lens as the objective, a 5 diopter lens as the eyepiece and the separation 30 cm between the two lenses. the least distance for clear vision is 25 cm.

Q.25 A compound microscope has a magnifying power of 100 when the image is formed at infinity. The objective has a focal length of 0.5 cm and the tube length is 6.5 cm. Find the focal length of the eyepiece.

Q.26 A compound microscope consists of an objective of focal length 1 cm and an eyepiece of focal length 5 cm. an object is placed at a distance of 0.5 cm from the objective. What should be the separation between the lenses so that the microscope projects an inverted real image of the object in a screen 30 cm behind the eyepiece ?

Q.27 The eyepiece of an astronomical telescope has a focal length of 10 cm. The telescope is focused for normal vision of distant objects when the tube length is 1.0 m. Find the focal length of the objective an d the magnifying power of the telescope.

Q.28 A professor reads a greeting card received on his 50th birthday with + 2.5 D glasses keeping the card 25 cm away. Ten years later, he reads his farewell letter with the same glasses but he has to keep the letter 50 cm away. What power of lens should he now use ?

Q.29 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.

Q.30 A lady cannot see objects closer than 40 cm from the left eye and closer than 100 cm from the right eye. While on a mountaineering trip, she is lost from her team. She tries to make an astronomical telescope from her reading glasses to look for her teammates.
(a) Which glass should she use as the eyepiece ?
(b) What magnification can she get with relaxed eye ?

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ANSWER KEY

EXERCISE–I

Q.1	A, B, C	Q.2	A	Q.3	A, D	Q.4	C	Q.5	A, B, D
Q.6	A, D	Q.7	B	Q.8	B	Q.9	D	Q.10	A, B, C
Q.11	D	Q.12	A	Q.13	D	Q.14	A	Q.15	B, C
Q.16	B, D	Q.17	A	Q.18	A	Q.19	D	Q.20	C
Q.21	D	Q.22	B	Q.23	D	Q.24	D		

EXERCISE–II

Q.1	-180,13.46 cm	Q.2	25 cm	Q.3	0.04 mm
Q.4	101 cm , f = 4 cm	Q.5	50, – 5 cm	Q.6	9 cm
Q.7	12 cm	Q.8	– 95/94 cm, – 94 cm	Q.9	L = 7.2 cm, M = 2.5
Q.10	$-\frac{190}{83}$ cm , – 41.5	Q.11	(i) 70.80, (ii) 2	Q.12	1.6 m
Q.13	7.1	Q.14	– 15	Q.15	(a) 10, (b) $\frac{185}{3}$ cm, $\frac{5}{3}$
Q.16	– 2	Q.17	(a) 2 cm, (b) 10 cm	Q.18	3.08
Q.19	7.0	Q.20	(a) $-\frac{241}{211}$ cm , (b) 42.2	Q.21	–50
Q.22	-53 cm	Q.23	8 X	Q.24	$\frac{67}{8}$
Q.25	2 cm	Q.26	5 cm	Q.27	90 cm, 9
Q.28	+ 4.5 D	Q.29	+ 60 D to + 51 D	Q.30	right lens, 2