

Marking Scheme:

(i) Each question is allotted 4 (four) marks for each correct response.

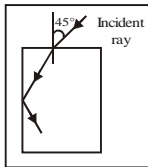
(ii) $\frac{1}{4}$ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

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- Q.1** A point object is placed at a distance of 10 cm and its real image is formed at a distance of 20 cm from a concave mirror. If the object is moved by 0.1 cm towards the mirror, the image will shift by about.
- (1) 0.4 cm away from the mirror
 (2) 0.4 cm towards the mirror
 (3) 0.8 cm away from the mirror
 (4) 0.8 cm towards the mirror
- Q.2** A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to $\frac{3}{4}$ of the angle of the prism. The angle of deviation is
- (1) 45° (2) 39°
 (3) 20° (4) 30°
- Q.3** The focal length of a convex lens is 10 cm and its refractive index is 1.5. If the radius of curvature of one surface is 7.5 cm, the radius of curvature of the second surface will be
- (1) 7.5 cm (2) 15.0 cm
 (3) 75 cm (4) 5.0 cm
- Q.4** The focal lengths of the objective and eye-piece of a telescope are respectively 100 cm and 2 cm. The moon subtends an angle of 0.5° at the eye. If it is looked through the telescope, the angle subtended by the moon's image will be
- (1) 100° (2) 50°
 (3) 25° (4) 10°
- Q.5** A man cannot see clearly the objects beyond a distance of 20 cm from his eyes. To see distant objects clearly he must use which kind of lenses and of what focal length
- (1) 10 cm convex (2) 100 cm concave
 (3) 20 cm convex (4) 20 cm concave
- Q.6** For a plano convex lens ($\mu = 1.5$) has radius of curvature 10 cm. It is silvered on its plane surface. Find focal length after silvering:-
- (1) 10 cm (2) 20 cm
 (3) 15 cm (4) 25 cm
- Q.7** A bubble in glass slab ($\mu = 1.5$) when viewed from one side appears at 5 cm and 2cm from other side, then thickness of slab is:-
- (1) 3.75 cm (2) 3 cm
 (3) 10.5 cm. (4) 2.5 cm
- Q.8** A film projector magnifies a film of area 100 square centimeter on screen. If linear magnification is 4 then area of magnified image on screen will be –
- (1) 1600 sq. cm (2) 800 sq. cm
 (3) 400 sq. cm (4) 200 sq. cm
- Q.9** The focal length of a convex mirror is 20 cm its radius of curvature will be
- (1) 10 cm (2) 20 cm
 (3) 30 cm (4) 40 cm
- Q.10** A ray of light propagates from glass (refractive index = $\frac{3}{2}$) to water (refractive index = $\frac{4}{3}$). The value of the critical angle
- (1) $\sin^{-1}(1/2)$ (2) $\sin^{-1}\left(\frac{\sqrt{8}}{9}\right)$
 (3) $\sin^{-1}(8/9)$ (4) $\sin^{-1}(5/7)$
- Q.11** In a laboratory four convex lenses L_1, L_2, L_3 and L_4 of focal lengths 2,4,6 and 8 cm respectively are available. Two of these lenses form a telescope of length 10 cm and magnifying power 4. The objective and eye lenses are
- (1) L_2, L_3 (2) L_1, L_4
 (3) L_3, L_2 (4) L_4, L_1
- Q.12** To remove myopia (short sightedness) a lens of power 0.66D is required. The distant point of the eye is approximately
- (1) 100 cm (2) 151.5 cm
 (3) 50 cm (4) 25 cm
- Q.13** The magnifying power of a simple microscope is 6. The focal length of its lens in metres will be, if least distance of distinct vision is 25 cm
- (1) 0.05 (2) 0.06
 (3) 0.25 (4) 0.12

Q.14 If a convex lens of focal length 80 cm and a concave lens of focal length 50 cm are combined together, what will be their resulting power

- (1) + 6.5 D (2) - 6.5 D
 (3) + 7.5 D (4) - 0.75 D

Q.15 For the given incident ray as shown in figure, the condition of total internal refraction of this ray the minimum refractive index of prism will be :-



- (1) $\frac{\sqrt{3}+1}{2}$ (2) $\frac{\sqrt{2}+1}{2}$
 (3) $\sqrt{\frac{3}{2}}$ (4) $\sqrt{\frac{7}{6}}$

Q.16 A bulb is located on a wall. Its image is to be obtained on a parallel wall with the help of convex lens. If the distance between parallel walls is 'd' then required focal length of lens placed in between the walls is

- (1) Only d/4
 (2) Only d/2
 (3) More than d/4 but less than d/2
 (4) Less than or equal to d/4

Q.17 Two plane mirrors are at 45° to each other. If an object is placed between them then the number of images will be

- (1) 5 (2) 9
 (3) 7 (4) 8

Q.18 An astronomical telescope has a magnifying power 10. The focal length of eyepiece is 20 cm. The focal length of objective is

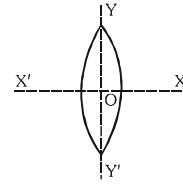
- (1) 2 cm (2) 200cm
 (3) 1/2 cm (4) 1/200 cm

Q.19 A person can not see the objects clearly placed at a distance more than 40 cm. He is advised to use a lens of power

- (1) - 2.5 D (2) + 2.5 D
 (3) - 6.25 D (4) + 1.5 D

Q.20 An equiconvex lens is cut into two halves along (i) XOX' and (ii) YOY' as shown in the figure. Let f, f', f'' be the focal lengths of the complete lens, of each half in case (i), and of each half in case (ii), respectively.

Choose the correct statement from the following



- (1) f' = f, f = 2f'' (2) f' = 2f, f'' = f
 (3) f' = f, f'' = f (4) f' = 2f, f'' = 2f

Q.21 The refractive index of the material of a prism is $\sqrt{2}$ and its refracting angle is 30°. One of the refracting surfaces of the prism is made a mirror inwards. A beam of monochromatic light entering the prism from the other face will retrace its path after reflection from the mirrored surface if its angle of incidence on the prism is :-

- (1) 60° (2) 0°
 (3) 30° (4) 45°

Q.22 A telescope has an objective lens of 10 cm. diameter and is situated at a distance of one kilometer from two objects. The minimum distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is 5000 Å, is of the order of

- (1) 5 m. (2) 5 mm.
 (3) 5 cm. (4) 0.5 m.

Q.23 A telescope has an objective lens of focal length 200 cm and an eye piece with focal length 2cm. If this telescope is used to see a 50 meter tall building at a distance of 2km, what is the height of the image of the building formed by the objective lens

- (1) 5 cm (2) 10
 (3) 1 cm (4) 2 cm

Q.24 A lens is made of flint glass (refractive index = 1.5). When the lens is immersed in a liquid of refractive index 1.25, the focal length

- (1) Increases to a factor of 1.25
 (2) Increases to a factor of 2.5
 (3) Increases to a factor of 1.2
 (4) Decreases to a factor of 1.2

Q.25 A microscope is focused on a mark on a piece of paper and then a slab of glass of thickness 3 cm and refractive index 1.5 is placed over the mark. How should the microscope be moved to get the mark in focus again

- (1) 1 cm upward (2) 4.5 cm downward
 (3) 1 cm downward (4) 2 cm upward

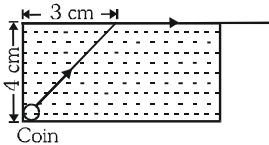
Q.26 A convex lens and a concave lens, each having same focal length of 25 cm, are put in contact to form a combination of lenses. The power in diopters of the combination is :

- (1) 25 (2) 50
(3) Infinite (4) Zero

Q.27 The frequency of a light wave in a material is 2×10^{14} Hz and wavelength is 5000\AA . The refractive index of material will be :

- (1) 1.33 (2) 1.40
(3) 1.50 (4) 3.00

Q.28 A small coin is resting on the bottom of a beaker filled with a liquid. A ray of light from the coin travels upto the surface of the liquid and moves along its surface (see figure).



How fast is the light travelling in the liquid ?

- (1) 1.2×10^8 m/s (2) 1.8×10^8 m/s
(3) 2.4×10^8 m/s (4) 3.0×10^8 m/s

Q.29 Two thin lenses of focal lengths f_1 and f_2 are in contact and coaxial. The power of the combination is:-

- (1) $\frac{f_1 + f_2}{2}$ (2) $\frac{f_1 + f_2}{f_1 f_2}$
(3) $\sqrt{\frac{f_1}{f_2}}$ (4) $\sqrt{\frac{f_2}{f_1}}$

Q.30 A lens having focal length f and aperture of diameter d forms an image of intensity I . Aperture of diameter $d/2$ in central region of lens is covered by a black paper. Focal length of lens and intensity of image now will be respectively :-

- (1) $\frac{f}{2}$ and $\frac{I}{2}$ (2) f and $\frac{I}{4}$
(3) $\frac{3f}{4}$ and $\frac{I}{2}$ (4) f and $3I/4$

Q.31 A ray of light travelling in a transparent medium of refractive index μ , falls on a surface separating the medium from air at an angle of incidence of 45° . For which of the following value of μ the ray can undergo total internal reflection ?

- (1) $\mu = 1.25$ (2) $\mu = 1.33$

- (3) $\mu = 1.40$ (4) $\mu = 1.50$

Q.32 The speed of light in media M_1 and M_2 is 1.5×10^8 m/s and 2.0×10^8 m/s respectively. A ray of light enters from medium M_1 to M_2 at an incidence angle i . If the ray suffers total internal reflection, the value of i is :-

- (1) Equal to or less than $\sin^{-1}(3/5)$
(2) Equal to or greater than $\sin^{-1}(3/4)$
(3) Less than $\sin^{-1}(2/3)$
(4) Equal to $\sin^{-1}(2/3)$

Q.33 A ray of light is incident on a 60° prism at the minimum deviation position. The angle of refraction at the first face (i.e., incident face) of the prism is:-

- (1) 30° (2) 45°
(3) 60° (4) Zero

Q.34 Which of the following is not due to total internal reflection ?

- (1) Working of optical fibre
(2) Difference between apparent and real depth of a pond
(3) Mirage on hot summer days
(4) Brilliance of diamond

Q.35 A biconvex lens has a radius of curvature of magnitude 20 cm. Which one of the following options describe best the image formed of an object of height 2 cm placed 30 cm from the lens ?

- (1) Virtual, upright, height = 1cm
(2) Virtual, upright, height = 0.5cm
(3) Real, inverted, height = 4cm
(4) Real, inverted, height = 1cm

Q.36 A thin prism of angle 15° made of glass of refractive index $\mu_1 = 1.5$ is combined with another prism of glass of refractive index $\mu_2 = 1.75$. The combination of the prisms produces dispersion without deviation. The angle of the second prism should be :-

- (1) 5° (2) 7° (3) 10° (4) 12°

Q.37 A converging beam of rays is incident on a diverging lens. Having passed through the lens the rays intersect at a point 15 cm from the lens on the opposite side. If the lens is removed the point where the rays meet will move 5 cm closer to the lens. The focal length of the lens is

- (1) 5 cm (2) -10 cm
(3) 20 cm (4) -30 cm

- Q.38** Two lens of focal length -20cm and $+10\text{cm}$ are put in combination, find the power of the combination:
 (1) -1D (2) -2D
 (3) $+5\text{D}$ (4) $+2\text{D}$
- Q.39** A far sighted person has his near point 50cm , find the power of lens he should use to see at 25cm , clearly:
 (1) $+1\text{ D}$ (2) $+2\text{ D}$
 (3) -2 D (4) -1D
- Q.40** The magnifying power of a telescope is 9 . When it is adjusted for parallel rays the distance between the objective and eyepiece is 20 cm . The focal length of lenses are :
 (1) $18\text{ cm}, 2\text{ cm}$ (2) $11\text{ cm}, 9\text{ cm}$
 (3) $10\text{ cm}, 10\text{ cm}$ (4) $15\text{ cm}, 5\text{ cm}$
- Q.41** A ray of light is incident at an angle of incidence, i , on one face of a prism of angle A (assumed to be small) and emerges normally from the opposite face. If the refractive index of the prism is μ , the angle of incidence i , is nearly equal to :
 (1) A/μ (2) $A/2\mu$
 (3) μA (4) $\mu A / 2$
- Q.42** A concave mirror of focal length ' f_1 ' is placed at a distance of ' d ' from a convex lens of focal length ' f_2 '. A beam of light coming from infinity and falling on this convex lens-concave mirror combination returns to infinity. The distance ' d ' must equal :
 (1) $2f_1 + f_2$ (2) $-2f_1 + f_2$
 (3) $f_1 + f_2$ (4) $-f_1 + f_2$
- Q.43** When a biconvex lens of glass having refractive index 1.47 is dipped in a liquid, it acts as a plane sheet of glass. This implies that the liquid must have refractive index.
 (1) greater than that of glass
 (2) less than that of glass
 (3) equal to that of glass
 (4) less than one
- Q.44** A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that its end closer to the pole is 20 cm away from the mirror. The length of the image is :-
 (1) 2.5 cm (2) 5 cm
 (3) 10 cm (4) 15 cm
- Q.45** For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index :-
 (1) is less than 1
 (2) is greater than 2
 (3) lies between $\sqrt{2}$ and 1
 (4) lies between 2 and $\sqrt{2}$

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