DPP No: 32

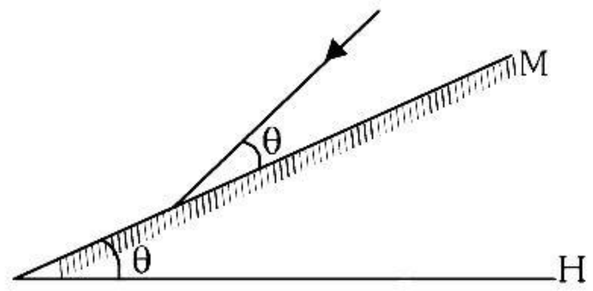
Maximum Time
50 Min

PHYSICS

TARGET
JEE-MAINS

SYLLABUS : GEOMETRICAL OPTICS

1. A mirror is inclined at an angle of θ with the horizontal. If a ray of light is incident at an angle θ as shown, then the angle made by reflected ray with the horizontal is



(A) θ (B) 2θ (C) $\frac{\theta}{2}$ (D) zero

2. Two plane mirrors are parallel to each other and spaced 20 cm apart. An object is kept in between them at 15 cm from A. Out of the following at which point(s) image(s) is/are not formed in mirror A (distance measured from mirror A):

(A) 15 cm (B) 25 cm (C) 45 cm (D) 55 cm

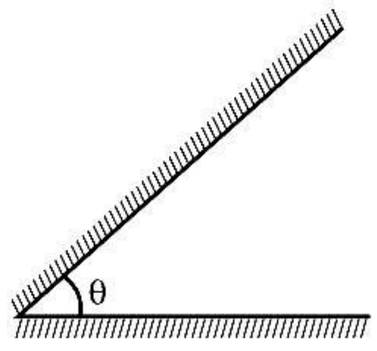
3. An unnumbered wall clock shows time 04: 25: 37, where 1st term represents hours, 2nd represents minutes and the last term represents seconds. What time will its image in a plane mirror show.

(A) 08: 35: 23 (B) 07: 35: 23 (C) 07: 34: 23 (D) none of these

4. Two plane mirrors are inclined to each other at an angle 60^0. If a ray of light incident on the first mirror is parallel to the second mirror, it is reflected from the second mirror

(A) Perpendicular to the first mirror (B) Parallel to the first mirror
(C) Parallel to the second mirror (D) Perpendicular to the second mirror

5. Two mirrors are inclined at an angle θ as shown in the figure. Light ray is incident parallel to one of the mirrors. Light will start retracing its path after third reflection if :



(A) $\theta = 45°$ (B) $\theta = 30°$ (C) $\theta = 60°$ (D) all three

6. A point object is kept in front of a plane mirror. The plane mirror is performing SHM of amplitude 2 cm. The plane mirror moves along the x-axis and x- axis is normal to the mirror. The amplitude of the mirror is such that the object is always infront of the mirror. The amplitude of SHM of the image is

(A) zero (B) 2 cm (C) 4 cm (D) 1 cm

7. A person's eye is at a height of 1.5 m. He stands infront of a 0.3m long plane mirror which is 0.8 m above the ground. The length of the image he sees of himself is:

(A) 1.5m (B) 1.0m (C) 0.8m (D) 0.6m

8. A plane mirror is moving with velocity $4\hat{i}+5\hat{j}+8\hat{k}$. A point object in front of the mirror moves with a velocity $3\hat{i}+4\hat{j}+5\hat{k}$. Here $\hat{k}$ is along the normal to the plane mirror and facing towards the object. The velocity of the image is :

(A) $-3\hat{i}-4\hat{j}+5\hat{k}$ (B) $3\hat{i}+4\hat{j}+11\hat{k}$ (C) $-3\hat{i}-4\hat{j}+11\hat{k}$ (D) $7\hat{i}+9\hat{j}+11\hat{k}$

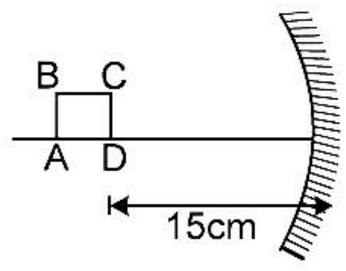
9. An object of height 1 cm is kept perpendicular to the principal axis of a convex mirror of radius of curvature 20 cm. If the distance of the object from the mirror is 20 cm then the distance (in cm) between heads of the image and the object will be:

(A) $\sqrt{\frac{6404}{9}}$ (B) $\sqrt{\frac{6414}{9}}$ (C) $\frac{40}{3}$ (D) none of these

10. A point object is kept between a plane mirror and a concave mirror facing each other. The distance between the mirrors is 22.5 cm. Plane mirror is placed perpendicular to principal axis of concave mirror. The radius of curvature of the concave mirror is 20 cm. What should be the distance of the object from the concave mirror so that after two successive reflections the final image is formed on the object itself ? (Consider first reflection from concave mirror)

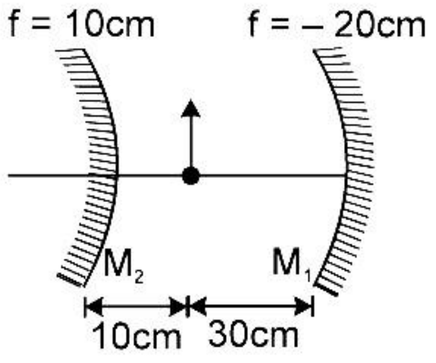
(A) 5 cm (B) 15 cm (C) 10 cm (D) 7.5 cm

11. A square ABCD of side 1mm is kept at distance 15 cm infront of the concave mirror as shown in the figure. The focal length of the mirror is 10 cm. The length of the perimeter of its image will be(nearly):



(A) 8 mm (B) 2 mm (C) 12 mm (D) 6 mm

12. In the figure shown find the total magnification after two successive reflections first on M_1 and then on M_2 .



(A) + 1 (B) – 2 (C) + 2 (D) – 1

13. A particle is moving towards a fixed spherical mirror. The image:

(A) must move away from the mirror

(B) must move towards the mirror

(C) may move towards the mirror

(D) will move towards the mirror, only if the mirror is convex.

14. A point object on the principal axis at a distance 15 cm in front of a concave mirror of radius of curvature 20 cm has velocity 2 mm/s perpendicular to the principal axis. The magnitude of velocity of image at that instant will be:

(A) 2 mm/s (B) 4 mm/s (C) 8 mm/s (D) 16 mm/s

15. A point object at 15 cm from a concave mirror of radius of curvature 20 cm is made to oscillate along the principal axis with amplitude 2 mm. The amplitude of its image will be

(A) 2 mm (B) 4 mm (C) 8 mm (D) 16 mm

16. The distance of an object from the focus of a convex mirror of radius of curvature ' a ' is ' b '. Then the distance of the image from the focus is:

(A) $b^2 / 4a$ (B) a / b^2 (C) $a^2 / 4b$ (D) $4b / a^2$

17. The largest distance of the image of a real object from a convex mirror of focal length 20 cm can be:

(A) 20 cm (B) infinite

(C) 10 cm (D) depends on the position of the object

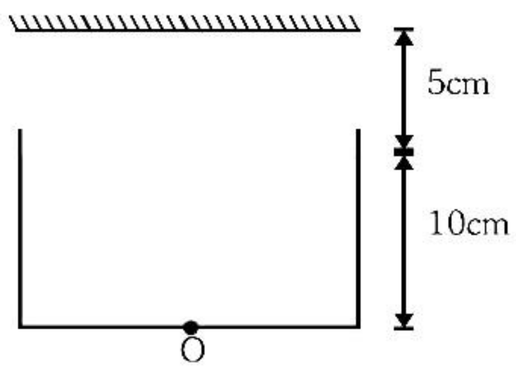
18. Which of the following can form erect, virtual, diminished image?

(A) plane mirror (B) concave mirror (C) convex mirror (D) none of these

19. A man uses a concave mirror for shaving. He keeps his face at a distance of 20 cm from the mirror and gets an image which is 1.5 times enlarged. Find the focal length of the mirror.

(A) 20 cm (B) 30 cm (C) 60 cm (D) 90 cm

20. Consider the situation shown in figure. Water $\left(\mu_w = \frac{4}{3}\right)$ is filled in a beaker upto a height of 10 cm. A plane mirror is fixed at a height of 5 cm from the surface of water. Distance of image from the mirror after reflection from it of an object O at the bottom of the beaker is–



(A) 15 cm (B) 12.5 cm (C) 7.5 cm (D) 10 cm

21. The wavelength of light in vacuum is 6000 A° and in a medium it is 4000 A°. The refractive index of the medium is:

(A) 2.4 (B) 1.5 (C) 1.2 (D) 0.67

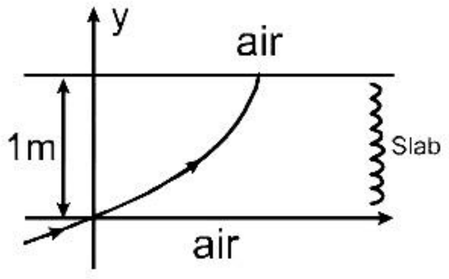
22. A ray of light passes from vacuum into a medium of refractive index n. If the angle of incidence is twice the angle of refraction, then the angle of incidence is:

(A) $\cos^{-1}(n/2)$ (B) $\sin^{-1}(n/2)$ (C) $2\cos^{-1}(n/2)$ (D) $2\sin^{-1}(n/2)$

23. A ray of light is incident on a parallel slab of thickness *t* and refractive index *n*. If the angle of incidence θ is small, then the displacement in the incident and emergent ray will be:

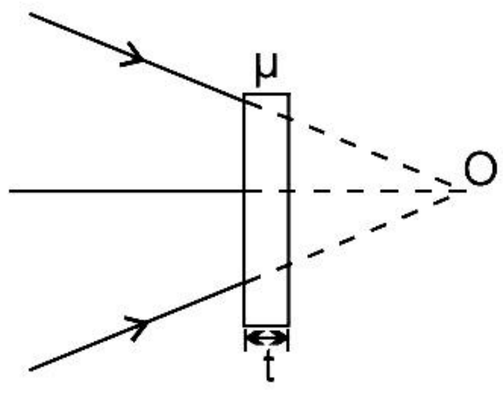
(A) $\frac{t\theta(n-1)}{n}$ (B) $\frac{t\theta}{n}$ (C) $\frac{t\theta n}{n-1}$ (D) none

24. A ray of light travelling in air is incident at grazing incidence on a slab with variable refractive index, $n(y) = [k y^{3/2} + 1]^{1/2}$ where $k = 1\ m^{-3/2}$ and follows path as shown in the figure. What is the total deviation produced by slab when the ray comes out.



(A) 60° (B) 53° (C) $\sin^{-1}(4/9)$ (D) no deviation at all

25. A beam of light is converging towards a point. A plane parallel plate of glass of thickness t, refractive index μ is introduced in the path of the beam as shown in the figure. The convergent point is shiftedby (assume near normal incidence):



(A) $t\left(1-\frac{1}{\mu}\right)$ away (B) $t\left(1+\frac{1}{\mu}\right)$ away (C) $t\left(1-\frac{1}{\mu}\right)$ nearer (D) $t\left(1+\frac{1}{\mu}\right)$ nearer

ANSWER KEY

1.	(D)	**2.**	(C)	**3.**	(C)	**4.**	(B)	**5.**	(B)
6.	(C)	**7.**	(D)	**8.**	(B)	**9.**	(A)	**10.**	(B)
11.	(C)	**12.**	(C)	**13.**	(C)	**14.**	(B)	**15.**	(C)
16.	(C)	**17.**	(A)	**18.**	(C)	**19.**	(C)	**20.**	(B)
21.	(B)	**22.**	(C)	**23.**	(A)	**24.**	(D)	**25.**	(A)