

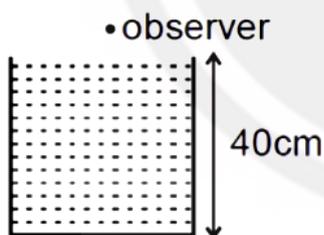
Prayas JEE (2025)

Physics Ray Optics

DPP: 6

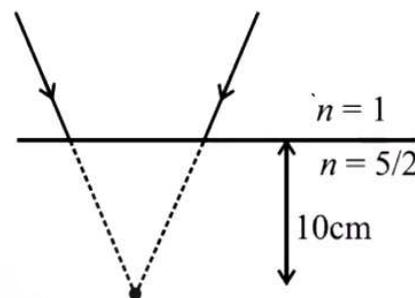
- Q1** A light ray falling at an angle of 60° with the surface of a clean slab of ice of thickness 1.00 m is refracted into it at an angle of 15° . Calculate the time taken by the light rays to cross the slab. Speed of light in vacuum $= 3 \times 10^8\text{ m/s}$.
- (A) $\frac{1}{3} \times 10^{-8}\text{sec}$.
 (B) $\frac{2}{3} \times 10^{-8}\text{sec}$.
 (C) $2 \times 10^{-8}\text{sec}$.
 (D) None of these

- Q2** In the given figure an observer in air ($n = 1$) sees the bottom of a beaker filled with water ($n = 4/3$) upto a height of 40 cm . What will be the depth felt by this observer.



- (A) 30 cm
 (B) 20 cm
 (C) 15 cm
 (D) 40 cm
- Q3** In the given figure rays incident on an interface would converge 10 cm below the interface if they continued to move in straight lines without bending. But due to refraction, the rays will bend and meet some where else. Find the distance of meeting point of refracted rays below the interface, assuming the rays to

be making small angles with the normal to the interface.

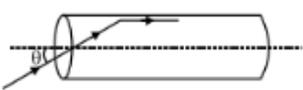


- (A) 25 cm
 (B) 15 cm
 (C) 30 cm
 (D) None of these
- Q4** Light goes from glass ($\mu = 3/2$) to air. Find the angle of incidence for which the angle of deviation is 90° .
- (A) 45°
 (B) 30°
 (C) 15°
 (D) None of these
- Q5** A ray of light passes from vacuum into a medium of refractive index n . If the angle of incidence is twice the angle of refraction, then the angle of incidence is:
- (A) $\cos^{-1} \left(\frac{n}{2} \right)$
 (B) $\sin^{-1} \left(\frac{n}{2} \right)$
 (C) $2 \cos^{-1} \left(\frac{n}{2} \right)$
 (D) $2 \sin^{-1} \left(\frac{n}{2} \right)$



Q6 A transparent solid cylindrical rod has a refractive index of $\frac{2}{\sqrt{3}}$. It is surrounded by air.

A light ray is incident at the mid-point of one end of the rod as shown in the figure. The incident angle (θ) for which the light ray grazes along the wall of the rod is



- (A) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$
- (B) $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$
- (C) $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$
- (D) $\sin^{-1}\left(\frac{1}{2}\right)$

Q7 If light travels a distance x in t_1 sec in air and $10x$ distance in t_2 sec in a medium, the critical angle of the medium will be

- (A) $\tan^{-1}\left(\frac{t_1}{t_2}\right)$
- (B) $\sin^{-1}\left(\frac{t_1}{t_2}\right)$
- (C) $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$
- (D) $\tan^{-1}\left(\frac{10t_1}{t_2}\right)$

Q8 Light wave enters from medium 1 to medium 2. Its velocity in 2nd medium is double from 1st. For total internal reflection the angle of incidence must be greater than

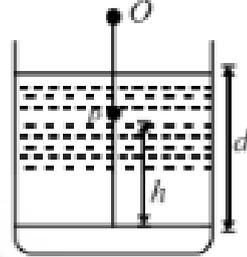
- (A) 30°
- (B) 60°
- (C) 45°
- (D) 90°

Q9 The critical angle of a medium with respect to air is 45° . The refractive index of medium is

- (A) 1.41
- (B) 1.2

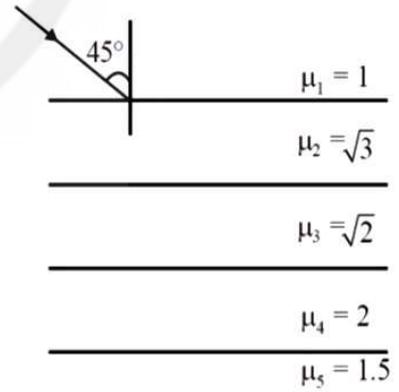
- (C) 1.5
- (D) 2

Q10 A plane mirror is placed at the bottom of the tank containing a liquid of refractive index n . P is a small object at a height h above the mirror. An observer O vertically above P outside the liquid sees P and its image in the mirror. The apparent distance between these two will be



- (A) $2nh$
- (B) $\frac{2h}{n}$
- (C) $\frac{2h}{n-1}$
- (D) $h\left(1 + \frac{1}{n}\right)$

Q11 In the figure shown below, the angle made by the light ray with the normal in the medium of refractive index $\sqrt{2}$ will be



- (A) 30 degree
- (B) 45 degree
- (C) 60 degree
- (D) 75 degree

Q12 A ray of light propagates from glass (refractive index = $3/2$) to water (refractive index = $4/3$). The value of the critical angle

- (A) $\sin^{-1}(1/2)$



(B) $\sin^{-1}\left(\frac{\sqrt{8}}{9}\right)$

(C) $\sin^{-1}(8/9)$

(D) $\sin^{-1}(5/7)$

Q13 The refractive index of water is $4/3$ and that of glass is $5/3$. What will be the critical angle for the ray of light entering water from the glass

(A) $\sin^{-1} \frac{4}{5}$

(B) $\sin^{-1} \frac{5}{4}$

(C) $\sin^{-1} \frac{1}{2}$

(D) $\sin^{-1} \frac{2}{1}$



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Answer Key

Q1 B
Q2 A
Q3 A
Q4 A
Q5 C
Q6 C
Q7 C

Q8 A
Q9 A
Q10 B
Q11 A
Q12 C
Q13 A



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