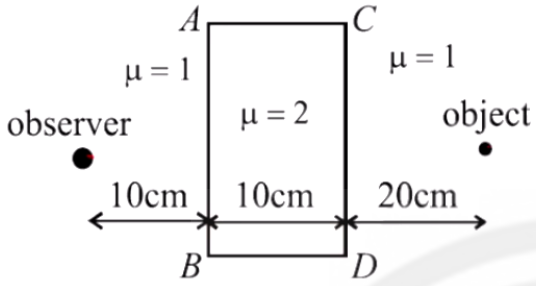
Prayas JEE (2025)

Physics

Ray Optics

DPP: 7

Q1 Find the apparent distance between the observer and the object shown in the figure:



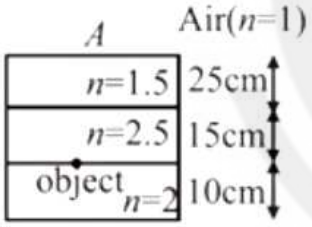
(A) $35\ \text{cm}$

(B) $20\ \text{cm}$

(C) $10\ \text{cm}$

(D) None of these

Q2 Find the apparent depth of the object seen by observer A (in the figure shown)



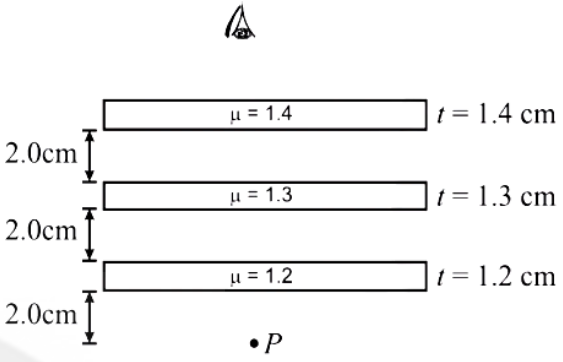
(A) $\frac{50}{3}\ \text{cm}$

(B) $\frac{45}{3}\ \text{cm}$

(C) $\frac{68}{3}\ \text{cm}$

(D) None of these

Q3 Locate the image of the point P as seen by the eye in the figure.



(A) $.6\ \text{cm}$ above P

(B) $0.3\ \text{cm}$ above P

(C) $0.9\ \text{cm}$ above P

(D) None of these

Q4 A small object is placed at the centre of the bottom of a cylindrical vessel of radius $3\ \text{cm}$ and height $3\sqrt{3}\ \text{cm}$ filled completely with a liquid. Consider the ray leaving the vessel through a corner. Suppose this ray and the ray along the axis of the vessel are used to trace the image. Find the apparent depth of the image. Refractive index of liquid $= \sqrt{3}$.

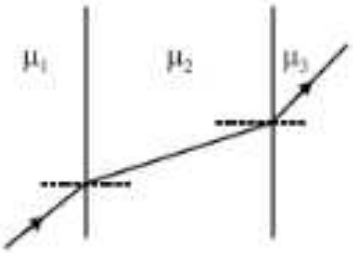
(A) $\sqrt{5}\ \text{cm}$

(B) $\sqrt{2}\ \text{cm}$

(C) $\sqrt{3}\ \text{cm}$

(D) $\sqrt{6}\ \text{cm}$

Q5 Figure below shows the paths of a portion of a ray of light as it passes through three different materials. Mark the correct relation among refractive indices of three materials



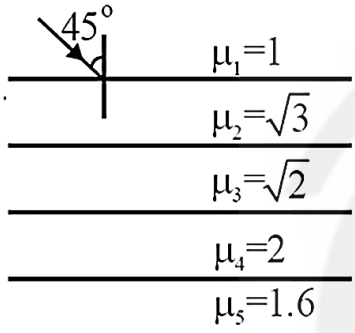
(A) $\mu_1 > \mu_2 > \mu_3$

(B) $\mu_2 > \mu_1 > \mu_3$

(C) $\mu_1 > \mu_3 > \mu_2$

(D) $\mu_2 > \mu_3 > \mu_1$

Q6 In the figure shown, the angle made by the light ray with the normal in the medium of refractive index $\sqrt{2}$ is



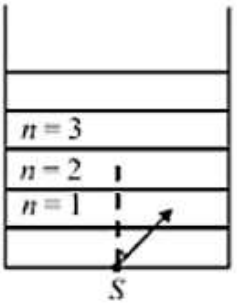
(A) 30°

(B) 60°

(C) 90°

(D) None of these

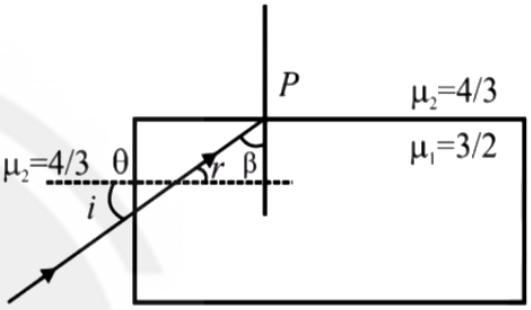
Q7 A point source S is placed at the bottom of different layers as shown in the figure. The refractive index of bottom most layer is μ_0. The refractive index of any other upper layer is $\mu(n) = \mu_0 - \frac{\mu_0}{4n-18}$ where $n = 1, 2, \ldots$. A ray of light with angle i slightly more than 30° starts from the source. Total internal reflection takes place at the upper surface of a layer having n equal to



(A) 3 (B) 5

(C) 4 (D) 6

Q8 In the shown figure, the minimum value of i so that total internal reflection never takes place at P.



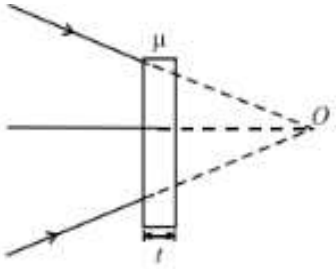
(A) $\cos^{-1}[\sqrt{8}/17]$

(B) $\sin^{-1}[\sqrt{8}/17]$

(C) $\cos^{-1}[\sqrt{17}/8]$

(D) $\sin^{-1}[\sqrt{17}/8]$

Q9 A beam of light is converging towards a point O. 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 shifted by (assume near normal incidence):



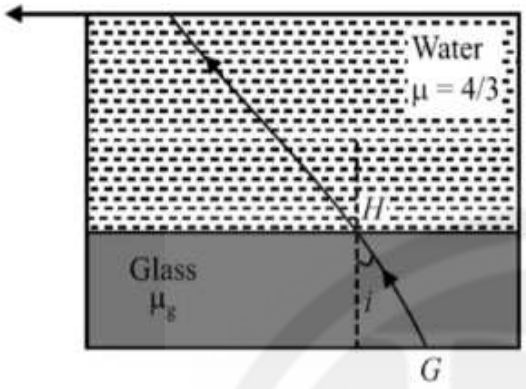
(A) $t\left(1 - \frac{1}{\mu}\right)$ away

(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

Q10 A ray of light travels in the fashion as shown in the figure. After passing through water, the ray grazes along the water-air interface. The value of μ_g in terms of i is



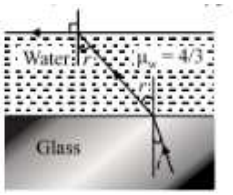
(A) $\frac{1}{\sin i}$

(B) $\frac{3}{4\sin i}$

(C) $\frac{4}{3\sin i}$

(D) None of these

Q11 A ray of light is incident at the glass-water interface at an angle i, it emerges finally parallel to the surface of water, then the value of μ_g would be



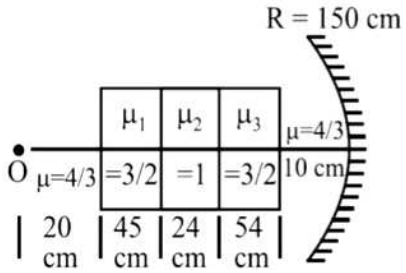
(A) $(4/3)\sin i$

(B) $1/\sin i$

(C) 4/3

(D) 1

Q12 In the figure shown, find the distance of the final image from the concave mirror



(A) $150\ \text{cm}$

(B) $143\ \text{cm}$

(C) $153\ \text{cm}$

(D) $170\ \text{cm}$

Answer Key

Q1	A
Q2	C
Q3	C
Q4	C
Q5	B
Q6	A
Q7	C
Q8	D
Q9	A
Q10	A
Q11	B
Q12	C

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