Physicsaholics

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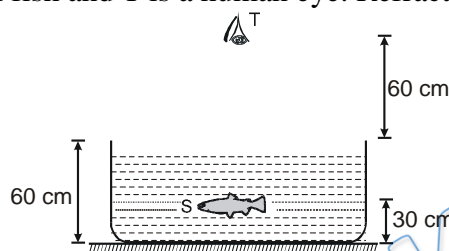
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Comprehension (Q1 to Q2)

Consider the situation in figure. The bottom of the pot is a reflecting plane mirror, S is a small fish and T is a human eye. Refractive index of water is 4/3.

Q 1. At what distance from itself will the fish see the image of the eye in upward direction?
(a) 35 cm   (b) 45 cm   (c) 55 cm   (d) 110 cm

Q 2. At what distance from itself will the fish see the image of the eye in downward direction?
(a) 90 cm   (b) 110 cm   (c) 170 cm   (d) 180 cm

Comprehension (Q3 to Q5)

There is an insect inside a cabin eying towards a thick glass plate P_1. Insect sees the images of light source across the glass plate P_1 outside the cabin. Cabin is made of thick glass plates of refractive index $\mu = 3/2$ and thickness 3 cm. Insect is eying from the middle of the cabin as shown in figure. (Glass plates are partially reflective and consider only paraxial rays)
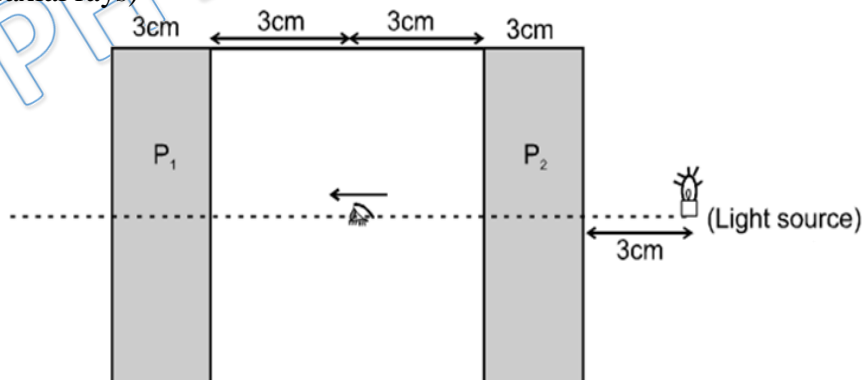
Q 3. At what distance (from eye of insect) will the eye see first image?
(a) 5 cm   (b) 7 cm   (c) 11 cm   (d) 14 cm

Q 4. At what distance (from eye of insect) will the eye see second image?

(a) 11 cm   (b) 13 cm   (c) 16.5 cm   (d) 18 cm

Q 5. Number of images seen by insect?
(a) 2   (b) 4   (c) 8   (d) ∞

Q 6. A 3 cm thick glass slab is polished on back surface. A point object is placed at 10 cm in front of unsilvered face of slab. What will be the position of final image from unsilvered face ($\tan \eta_{glass} = 1.5$)?
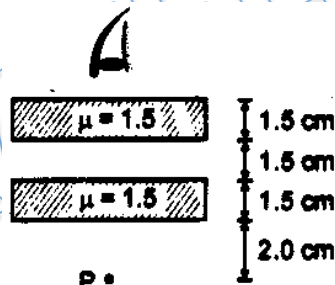(a) 12 cm   (b) 14 cm   (c) 10 cm   (d) 16 cm

Q 7. In the diagram, an object is placed at distance 20 cm from pole. In this condition object and image coincide. Radius of curvature of mirror is 25 cm, refractive index of liquid is
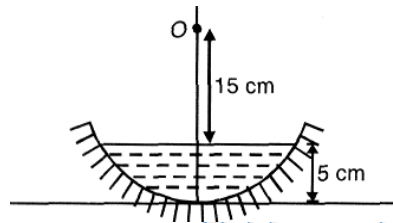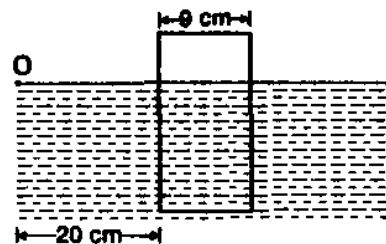

(a) 4/3   (b) 3/2   (c) 9/8   (d) 6/5

Q 8. The image of point P when viewed from top of the slabs will be:


(a) 2.0 cm above P   (b) 1.5 cm above P
(c) 2.0 cm below P   (d) 1 cm above P

Q 9. A point object is placed at a distance of 20 cm from a glass slab, half immersed in water as shown in figure. The distance between two images when seen from the other side of the slab is : $\left(\mu_g = \frac{3}{2} \ and \ \mu_w = \frac{4}{3}\right)$ is


(a) 4 cm   (b) 2 cm
(c) 6 cm   (d) only one image is formed

Q 10. A point source S is placed at a height h from the bottom of a vessel of height H(< h). The vessel is polished at the base. Water is gradually filled in the vessel at a constant rate α m³/s. The distance d of image of the source from the bottom of the vessel varies with time t as:


(a)   (b)

(c)   (d)
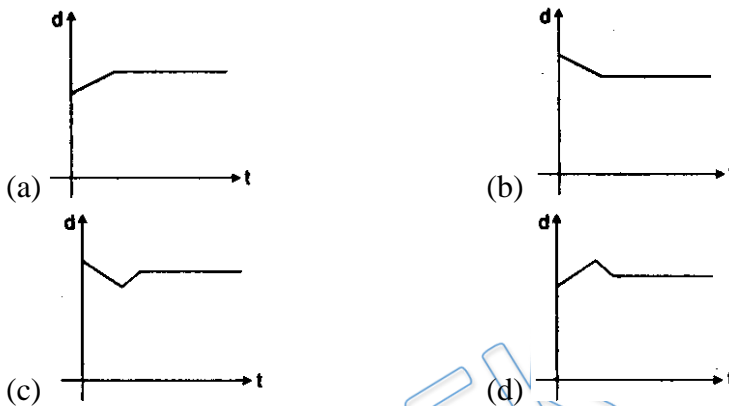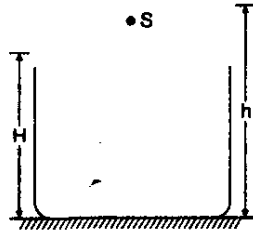
Q 11. A diverging beam of light from a point source S having divergence angle a falls symmetrically on a glass slab as shown. The angles of Incidence of the two extreme rays are equal. If the thickness of the glass slab is r and its refractive Index is it, then the divergence angle of the emergent beam is :
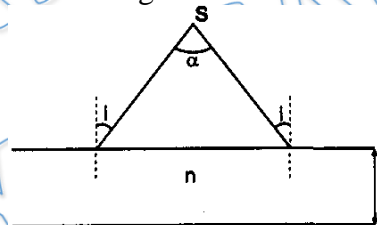
(a) zero   (b) α (c) $\sin^{-1}(1/n)$ (d) $2\sin^{-1}(1/n)$

Q 12. A plane mirror is placed at the bottom of a tank containing a liquid of refractive index μ. 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
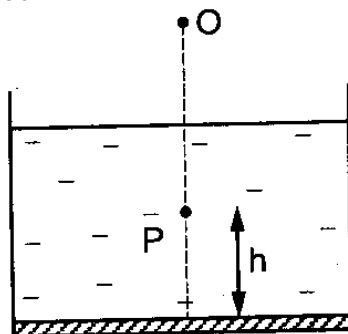
(a) 2μh   (b) $\frac{2h}{\mu}$ (c) $\frac{2h}{\mu-1}$ (d) $h\left(1+\frac{1}{\mu}\right)$

Q 13. A bird flies down vertically towards a water surface. To a fish inside the water, vertically below the bird, the bird will appear to
(a) be farther away than its actual distance
(b) be closer than its actual distance
(c) move faster than its actual speed
(d) move slower than its actual speed

Q 14. T is a point at the bottom of a tank filled with water, as shown. The refractive index of water is 4/3. YPT is the vertical line through T. To an observer at the position O, T will appear to be
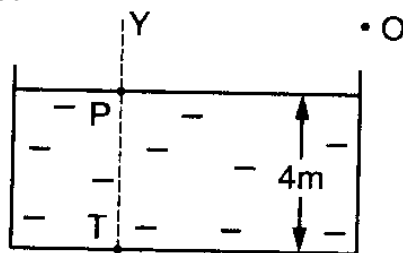
(a) to the left of YT   (b) somewhere on YT
(c) at a depth 3 m below T   (d) at a depth < 3m below P

Answer Key

Q.1 d	Q.2 c	Q.3 d	Q.4 d	Q.5 d
Q.6 b	Q.7 a	Q.8 d	Q.9 b	Q.10 b
Q.11 b	Q.12 b	Q.13 a, c	Q.14 a, d	