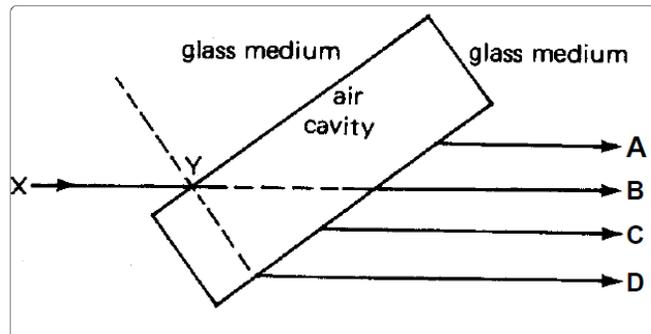


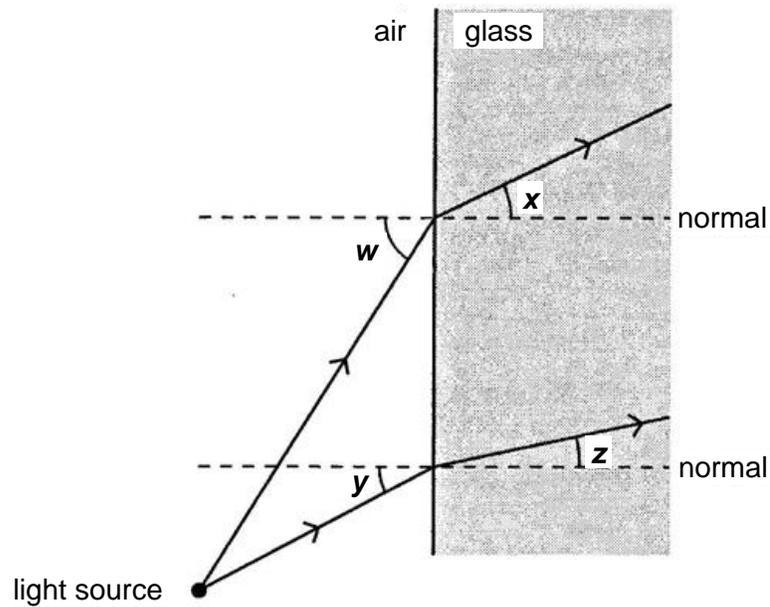
Refraction

- 1 A ray of light **XY** incident on a rectangular air cavity.



Which of the four rays **A**, **B**, **C** or **D** is most likely to represent the path of the light ray in the glass after emerging from the air cavity?

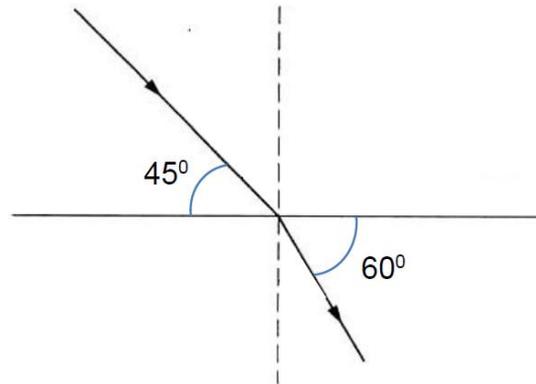
- 2 The diagram shows two rays of light entering a glass block.



Which equation is correct?

- A $\frac{w}{x} = \frac{y}{z}$
 B $w \times z = y \times z$
 C $\sin w \times \sin z = \sin y \times \sin x$
 D $\frac{\sin w}{\sin z} = \frac{\sin y}{\sin x}$

- 3 A ray of light travels from air to glass as shown.

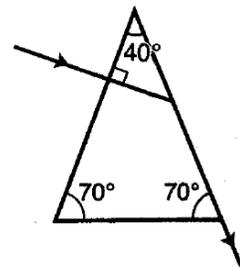


The speed of light in air is 3.00×10^8 m / s. What is the speed of light in the glass?

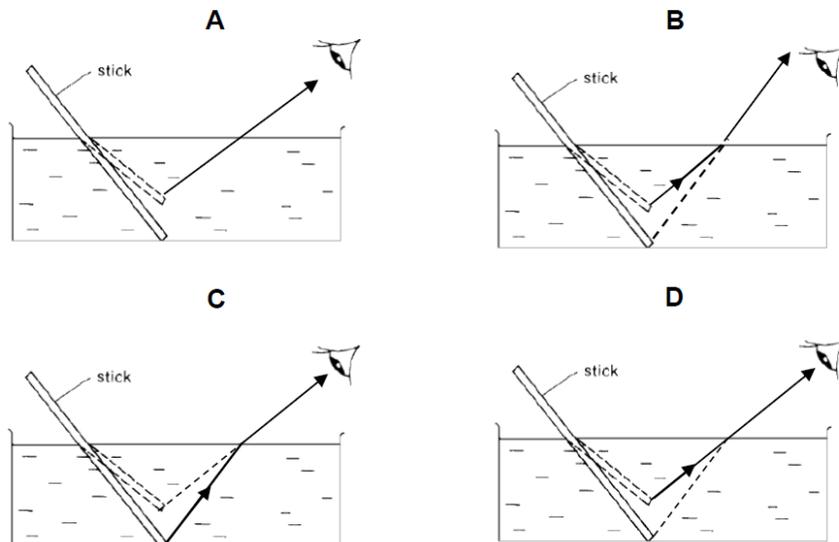
- A 2.12×10^8 m / s
 B 2.45×10^8 m / s
 C 3.67×10^8 m / s
 D 4.00×10^8 m / s
- 4 The diagram on the right shows the path of a light ray.

What is the value of refractive index of the medium?

- A 1.06
 B 1.31
 C 1.46
 D 1.56



- 5 Zac observes a stick in a trough containing water. Which of the following diagram shows correctly how Zac sees the stick?



6 Fig. 6.1 shows a ray of light directed towards a transparent block made of material P.

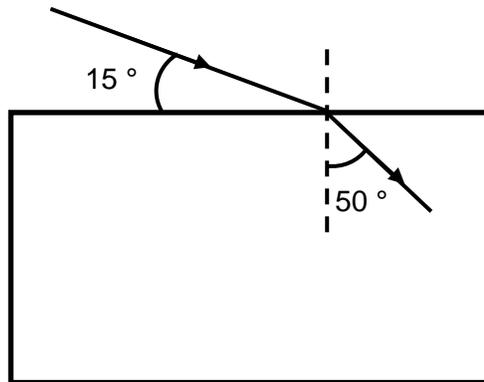


Fig. 6.1

(a) Determine the refractive index of material P.

refractive index =

(b) In Fig. 6.1, draw the subsequent path of the ray until it emerges from the block. Indicate the angles along the path of the ray.

(c) Calculate the speed of light when it enters the transparent block. Take the speed of light in vacuum to be 3.00×10^8 m / s.

speed of light in transparent block =

- 7 A student sets up an experiment to investigate the path of laser light as it passes through a glass tank filled with water in **Fig. 4.1**. The light enters the glass tank along the normal at point B and then reflects off a mirror submerged in the water. The refractive index of water is 1.33.

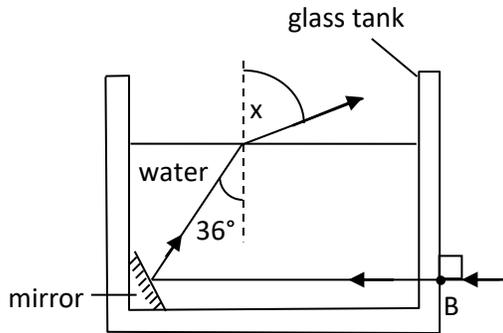


Fig. 4.1

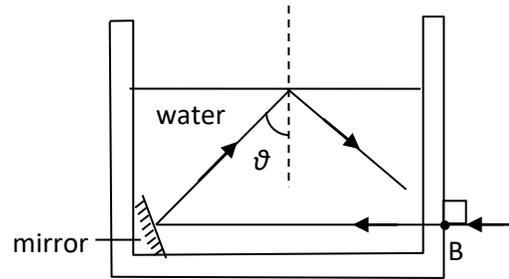


Fig. 4.2

- (a) Explain why the path of light ray at point B is along the normal.

- (b) Calculate angle x.

Fig. 4.2 shows the new path taken by the light ray after the mirror is adjusted.

- (c) Calculate the critical angle.

- (d) The water in **Fig. 4.2** is replaced with liquid X that has a higher refractive index than water as shown in **Fig. 4.3**. Draw the new path of the light ray after it has reflected off the mirror.

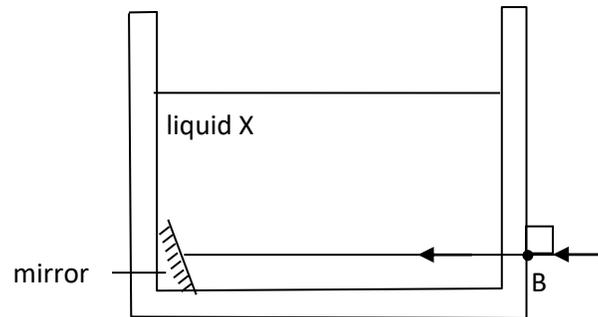


Fig. 4.3

- 8 Fig.11.4 shows the **plan view** of a fish tank. The refractive index of water is 1.33. The diagram is **not** drawn to scale.

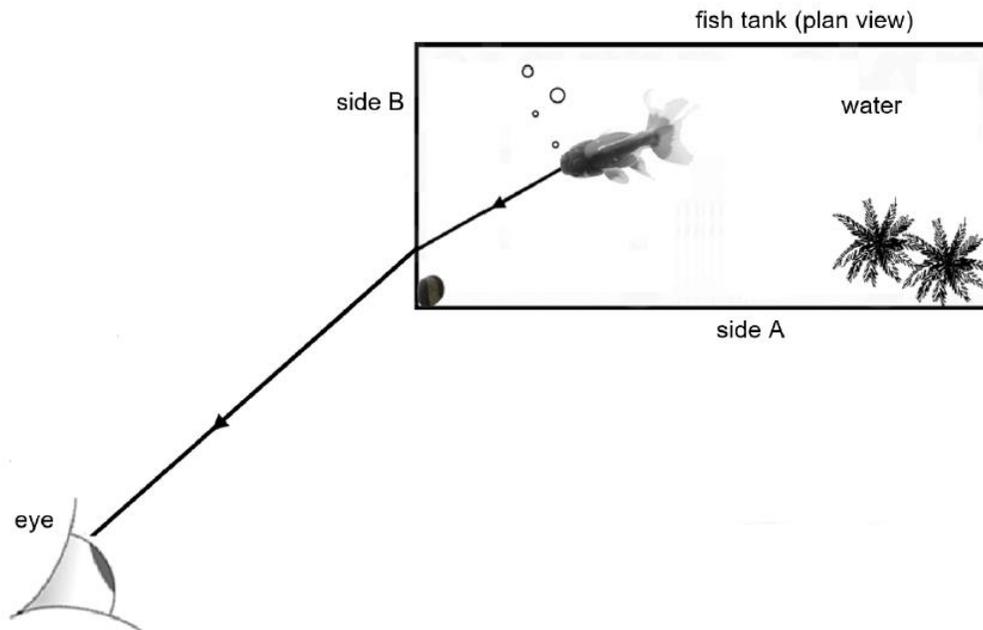


Fig. 11.4

A boy can see **two** images of the gold fish when he looks from the position shown. Fig.11.4 shows a ray of light, from the head of the fish that is *refracted* at side **B** of the tank. The ray enters the eye as shown.

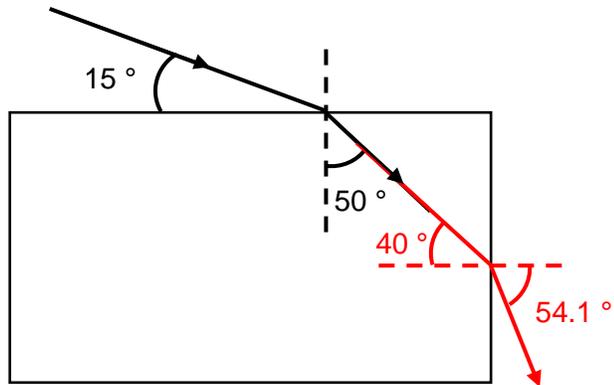
- (a) Explain what is meant by the *refractive index of water is 1.33*.
-
-
- (b) On Fig. 11.4, indicate the angle of refraction at side **B** of the tank. Label it as r .
- (c) On Fig. 11.4, draw a second ray from the head of the fish to the eye that is refracted at side **A** of the tank.
- (d) Hence, locate the probable positions of the two images of the head of the fish. Label them as I_1 and I_2 .

Answers

ACADC

6 (a) 1.26

(b) critical angle = 52.5°
refracted angle = 54.1°



(c) $2.38 \times 10^8 \text{ m/s}$

7 (a) Zero angle of incidence will cause zero angle of refraction in accordance to Snell's law where $\sin i / \sin r = \text{constant } 1.33$
OR angle of refraction is 0°

(b) 51.4°

(c) 48.8°

(d)

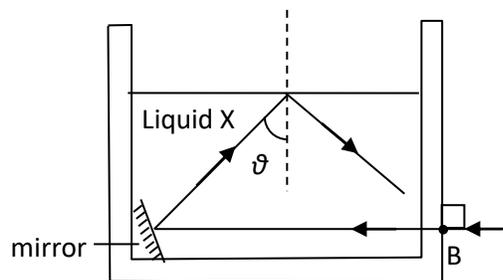


Fig. 4.3

8 (a) It means that the ratio of the speed of light in vacuum to the speed of light in medium is 1.33.

(b) – (d)

