

Ch 25 Assigned Questions

2014 Spring
PHYS 1C6

1. $n=1.63$ $n=1.52$

$$1.63 \cdot \sin \theta_c = 1.52 \cdot \sin 90^\circ = 1.52$$

$$\therefore \theta_c = \sin^{-1}\left(\frac{1.52}{1.63}\right) = 68.8^\circ$$

3. (e) frequency the same ; the wavelength and the speed decreases.

4. $\lambda_n = \frac{\lambda_{\text{air}}}{n} \Rightarrow n = \frac{\lambda_{\text{air}}}{\lambda_n} = \frac{495 \times 10^{-9}}{434 \times 10^{-9}} = 1.14$

5. (b) \therefore frequency will be the same, and $\lambda_n = \frac{\lambda_{\text{air}}}{n} = \frac{3}{4} \lambda_{\text{air}}$, $v_n = \frac{v_{\text{air}}}{n} = \frac{3}{4} v_{\text{air}}$ ↙ speed in the air

6. (i) Total internal reflection only occurs when light enters into a medium with smaller n from a greater n .

$\therefore n_{\text{air}} = 1$ and $n_{\text{water}} = \frac{4}{3}$ \therefore from water to air (a)

(ii) The sound travels faster in water than in the air, thus for sound waves, $n_{\text{air}} > n_{\text{water}}$

\therefore total internal reflection occurs from air to water - (d)

7. With the same argument above, (b), is the correct answer.

8. From the picture, A (dashed line) changes direction more than B. It means that A bends toward the normal more at interface ① than B does. \therefore A travels more slowly in the prism.

11. Interface ① : $1 \cdot \sin \alpha = n_1 \sin \beta$ (note that $\sin \alpha$ also = $\cos \theta$)
Interface ② : $n_1 \sin \beta = n_2 \sin \phi$
Interface ③ : $n_2 \sin \phi = 1 \cdot \sin \phi$
So we have $\cos \theta = \sin \phi$
 \Rightarrow No answer. (see the note)

§ TA's note : In the question, θ is defined as the angle between the light and the surface, which gives no answer. If θ is defined as the angle with respect to "the normal" (which is, α), then the answer will be (c) $\theta = \phi$.

12. Light travels slower in water. \therefore C (verify with a ruler)

14. Blue lights bend more than red lights. (see textbook p.863) \therefore C