

## Honors Physics Optics HW, Ch. 22 (Homework)

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1.

Light is incident normally on a 1.60 cm layer of water that lies on top of a flat Lucite plate with a thickness of 0.300 cm. How much more time is required for light to pass through this double layer than is required to traverse the same distance in air? ( $n_{\text{Lucite}} = 1.59$ )

2.

Find the speeds of light in

- (a) crown glass,
- (b) ethyl alcohol, and
- (c) diamond.

3.

A ray of light strikes a flat 2.00 cm thick block of crown glass ( $n = 1.52$ ) at an angle of  $30.0^\circ$  with the normal (Fig. P22.16). Trace the light beam through the crown glass and find the angles of incidence and refraction at each surface.

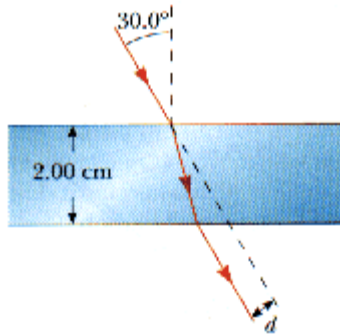


Figure P22.16.

4.

A submarine is 300 m horizontally out from the shore and 124 m beneath the surface of the water. A laser beam is sent from the sub so that it strikes the surface of the water at a point 210 m from the shore. If the beam just strikes the top of a building standing directly at the water's edge, find the height of the building.

5.

Calculate the critical angles for the following materials when surrounded by air:

- (a) flint glass,
- (b) fused quartz,
- (c) polystyrene.

Assume that  $\lambda = 589$  nm.