Refraction

Class 21: (ThT Q)
Did you complete at least 50% of Chapter 35?

A. Yes  
B. No  

Note:

<table>
<thead>
<tr>
<th>#</th>
<th>Date</th>
<th>Read/topic</th>
<th>Quizzes</th>
<th>HW Due</th>
<th>Labs</th>
<th>Exams</th>
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<tbody>
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<td>Fri. May 20</td>
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<td>23</td>
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<td>17</td>
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<td>Mon. May 23</td>
<td>36.6–7</td>
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<td>23</td>
<td>18</td>
<td></td>
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<td>Wed. May 25</td>
<td>36.8–10</td>
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<td>19</td>
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<td>40.5–8; 42.1,3</td>
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<td>31</td>
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<td>Review</td>
<td>45.5–5</td>
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<td>Review</td>
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Final Anytime during finals, when TC is open. June 15 & 16 Plan >3 hr.
When lights travels from air into glass its speed

A. increases
B. decreases OR
C. stays the same
Wavelength: decreases in medium

Frequency does NOT change.

Serway, Physics for Scientists and Engineers, 5/e
Figure 35.13
What is/cause refraction?

Time for CR: refraction/ animation
Which path best represents the path of light as it passes from air into glass?

A. bent toward normal
B. bent away from normal OR
C. stays the same
Figure 35.9a

Diagram showing the reflection and refraction of a light ray at the boundary between two media: air and glass. The incident ray (from point A to B) hits the glass surface at an angle $\theta_1$ and is reflected back into the air at an angle $\theta_1'$. A portion of the light ray enters the glass and is refracted at an angle $\theta_2$. The refractive indices of the air and glass are $\nu_1$ and $\nu_2$, respectively.
Which path best represents the path of light as it passes from glass into air?

A. bent toward normal
B. bent away from normal OR
C. stays the same
A ray of light passes through a pane of glass which is 1.0 cm thick. The index of refraction of the glass is 1.53. The angle between the normal to the surface of the pane and the ray in the air as it enters the pane is [01].

a) Find the angle between the normal to the surface of the pane and the ray inside the glass.

b) Find the angle between the normal to the surface of the pane and the ray in the air after it exits the pane.
Which path best represents the path of light as it leaves the prism?
A. bent toward normal
B. bent away from normal OR
C. stays the same
Which path best represents the path of light as it enters the prism?

A. bent strongly away from normal
B. bent towards normal OR
C. stays the same
Serway, Physics for Scientists and Engineers, 5/e
Figure 35.20

![Graph showing refractive index n as a function of wavelength λ (in nm) for different materials: Crown glass, Acrylic, and Fused quartz.](image)
Red light travels faster in glass than violet light. Which color is bent most as it leaves the prism?

A. red
B. violet
Light passes through a glass prism, as shown in the figure. The cross-section of the prism is an equilateral triangle. (a) Find the incident angle, if we want the light ray inside the prism to be parallel to the base of the prism. Use [02] for the index of refraction of glass. Remember that the incident angle is measured with respect to a line normal to the surface of the prism. Hint: you can see that $\theta_2$ is $30^\circ$ and can work backwards to get $\theta_1$.

(b) The index of refraction of glass for blue light is 1.528. Using the incident angle from part (a), find the angle at which blue light exits the prism. This is not the angle of deviation shown in the figure. We want the angle between the light and a line normal to the surface from which the light exits.

(c) Repeat part (b) for red light, for which the index of refraction is 1.511.

Caution: In parts (b) and (c), the light ray inside the prism is no longer parallel to the base of the prism.
Consider a fish: What time does it see the sun go down.

A. 3:30 p.m.
B. 6:00 p.m.
In the diving pool in the Richards Building, there is a glass window under the water. There is a room full of air on the other side of the glass window pane. If I dive under the water and look at the window, I notice that I can see the room on the other side of the window only through a circular area. Outside that circle, light undergoes total internal reflection at the surface between the glass and the air, and the window appears like a mirror. If I am 0.03 m from the window, find the radius of the circle. The index of refraction of water is 1.33, and the index of refraction of glass is 1.52. Be sure to take into account that the light ray which is refracted at the glass-air surface is also refracted at the glass-water surface and changes direction there too. Hint: you need to start in the room and work backwards. Light rays are reversible. When you get done see if the answer is the same as you get for air-water without glass.
17-4. A glass fiber \((n = 0.4)\) is submerged in water \((n = 1.333)\). What is the critical angle for light to stay inside the optical fiber?