ConcepTest 32.4b Refraction II

Parallel light rays cross interfaces from medium 1 into medium 2 and then into medium 3. What can we say about the relative sizes of the index of refraction of these media?

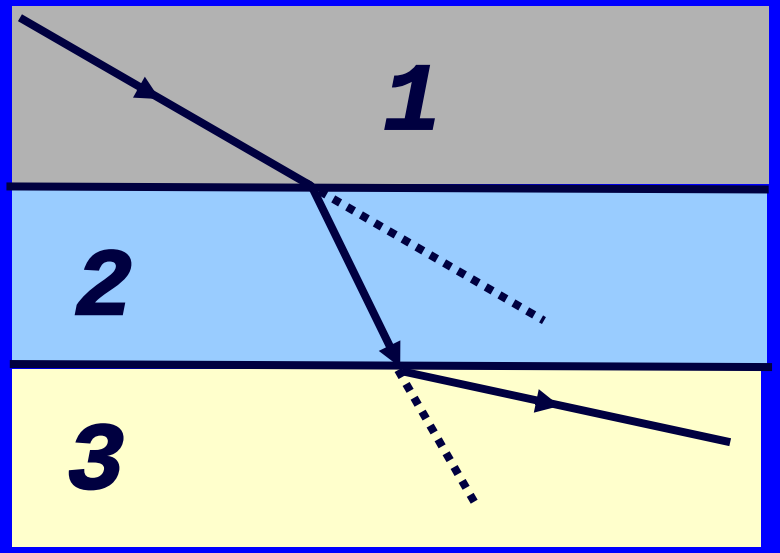
1) $n_1 > n_2 > n_3$

2) $n_3 > n_2 > n_1$

3) $n_2 > n_3 > n_1$

4) $n_1 > n_3 > n_2$

5) none of the above



ConcepTest 32.4b Refraction II

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2) $n_3 > n_2 > n_1$
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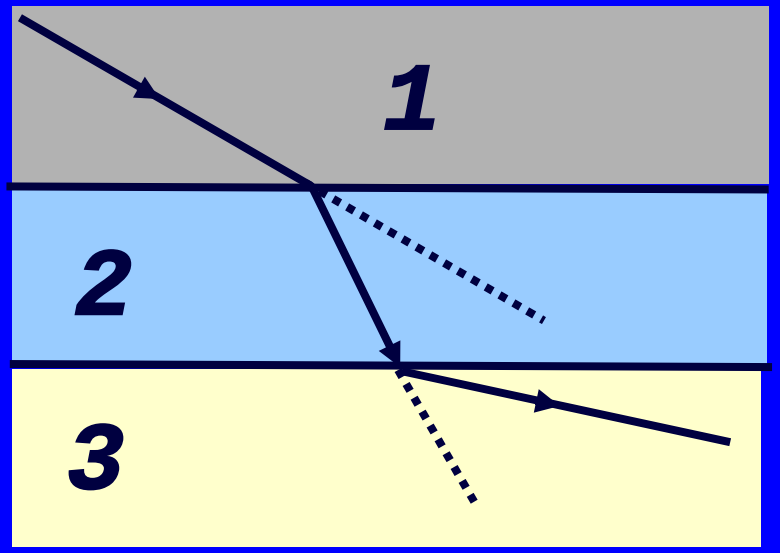
4) $n_1 > n_3 > n_2$
5) none of the above

The rays are bent toward the normal when crossing into #2, so $n_2 > n_1$. But rays are bent away from the normal when going into #3, so $n_3 < n_2$. How to find the relationship between #1 and #3? Ignore medium #2! So the rays are bent away from the normal if they would pass from #1 directly into #3. Thus, we have: $n_2 > n_1 > n_3$.



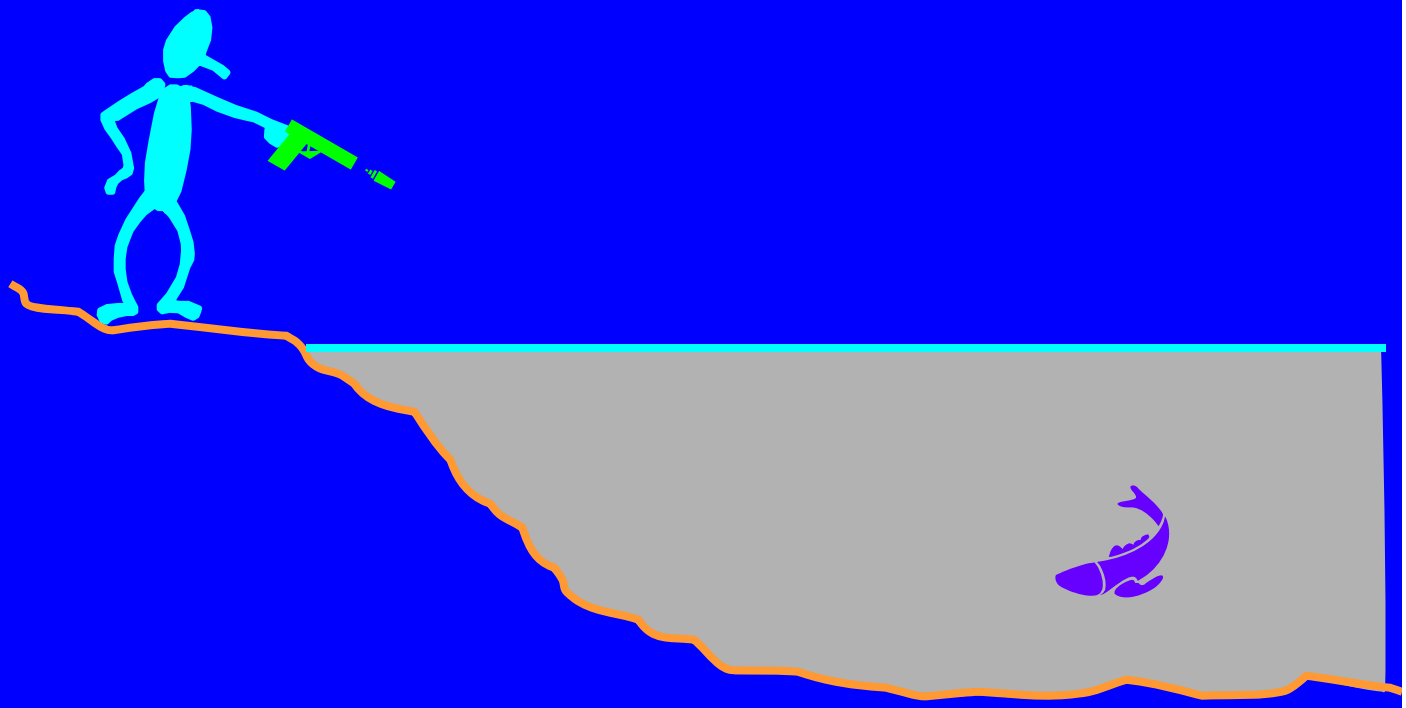
ConcepTest 32.5a Gone Fishin' I

To shoot a fish with a gun, should you aim directly at the image, slightly above, or slightly below?

1) aim directly at the image

2) aim slightly above

3) aim slightly below



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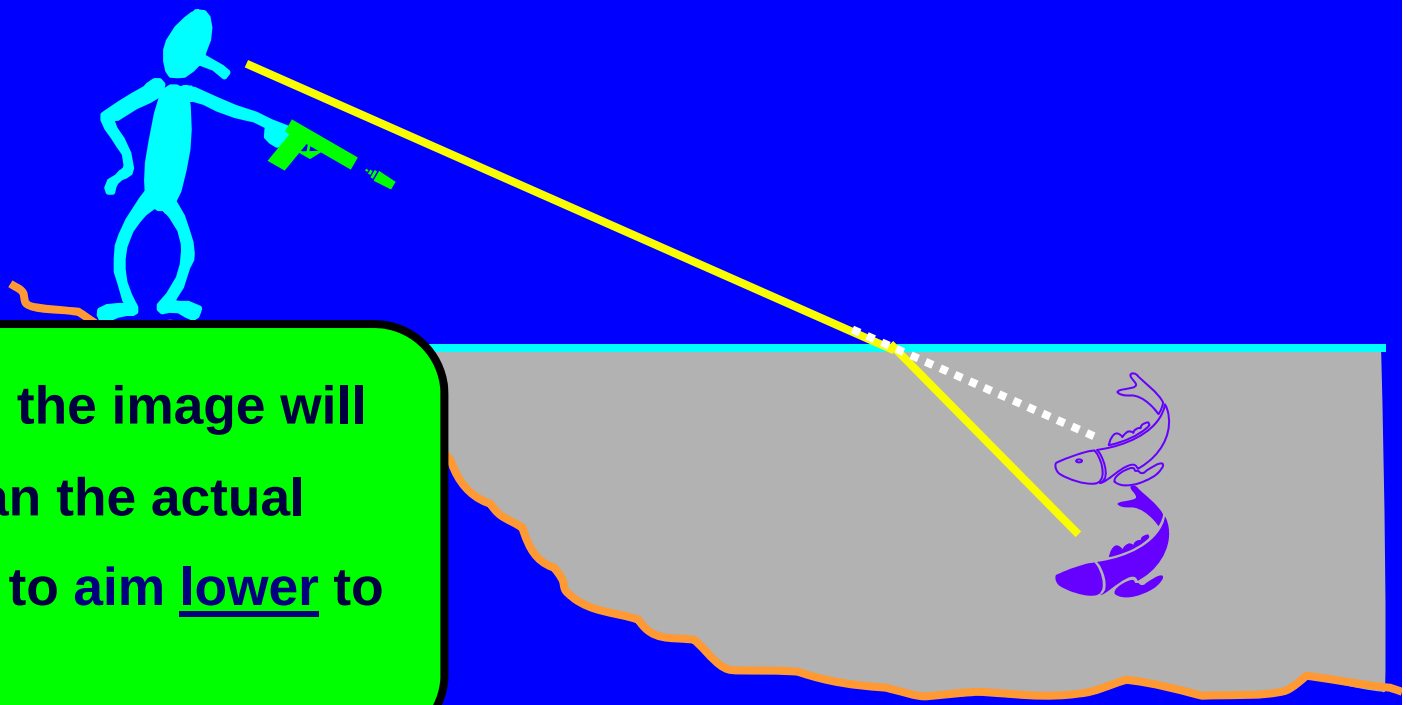


Due to refraction, the image will appear higher than the actual fish, so you have to aim lower to compensate.

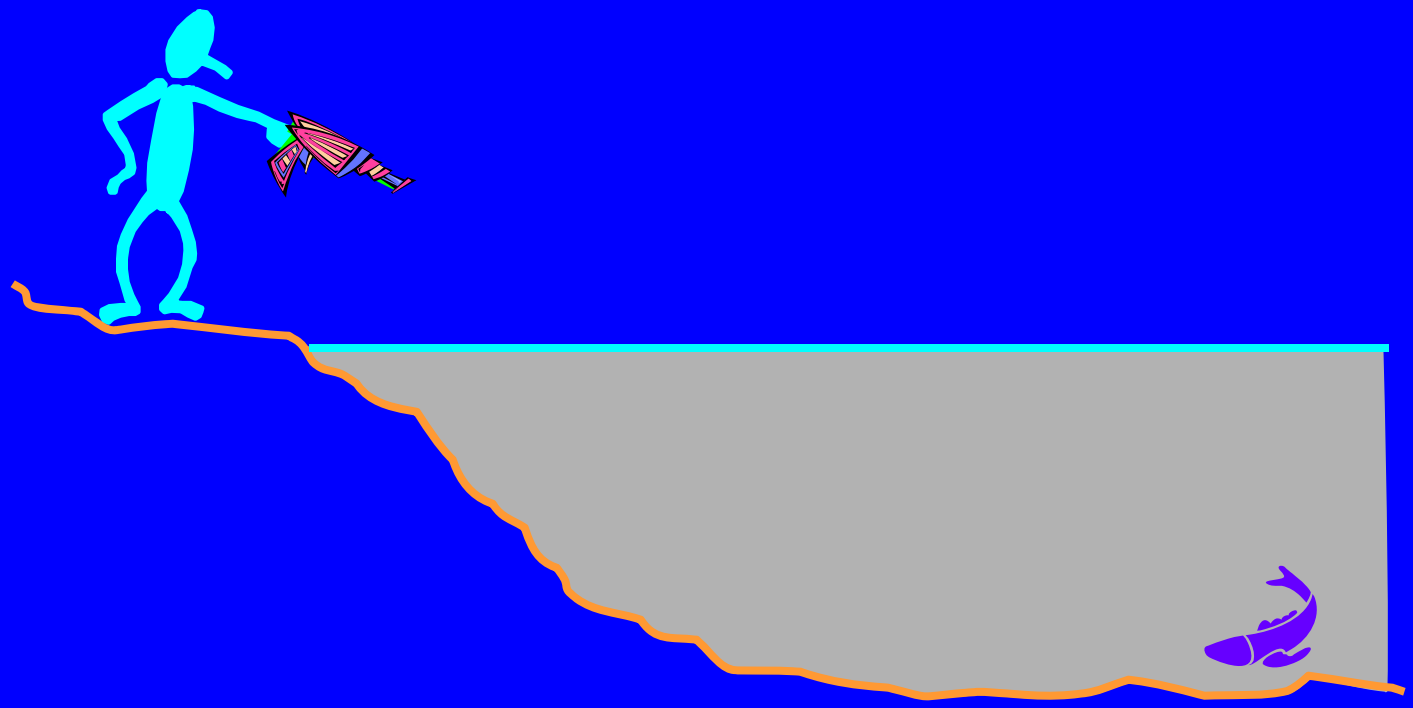
ConcepTest 32.5b Gone Fishin' II

To shoot a fish with a *laser gun*, should you aim directly at the image, slightly above, or slightly below?

1) aim directly at the image

2) aim slightly above

3) aim slightly below



ConcepTest 32.5b Gone Fishin' II

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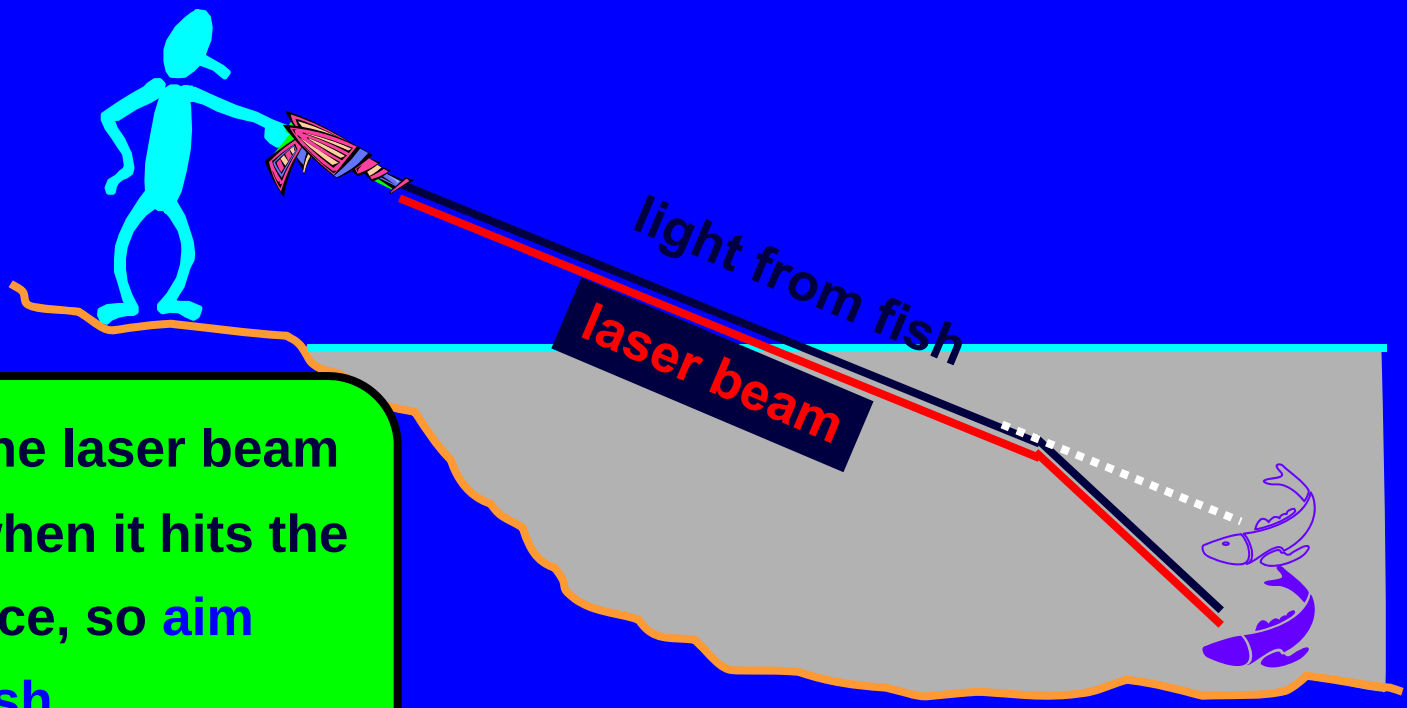
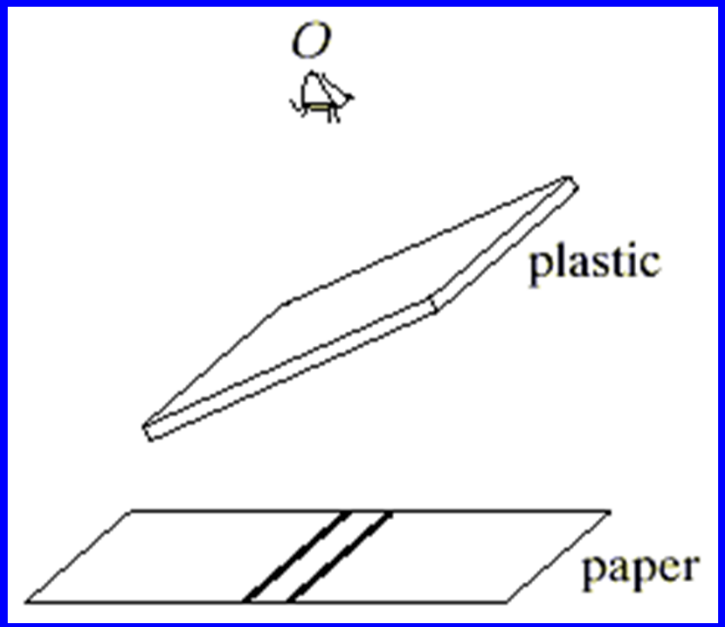


The light from the laser beam will also bend when it hits the air-water interface, so aim directly at the fish.

ConcepTest 32.6 Parallel Lines

An observer views two closely spaced lines through an angled piece of glass. To the observer, the lines appear:

1) shifted to the right
2) shifted to the left
3) spaced farther apart
4) spaced closer together
5) no change – same as before



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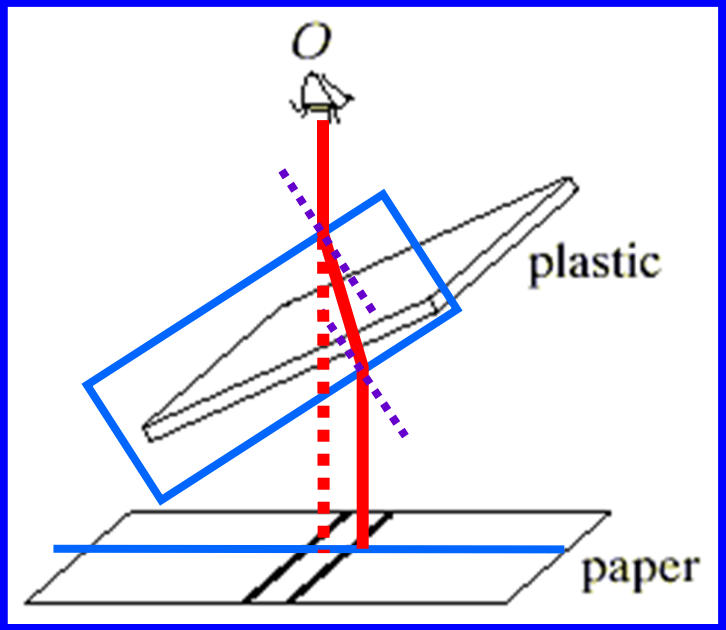
The light rays get refracted twice, so they remain parallel, but they shift to the left, as seen in the figure. Their relative spacing does not change, just the overall position.



Follow-up: What happens when the top glass moves toward the bottom glass?