

2011-12 PreAP Light and Optics 7

You will need your "Critical Angle" notes.

- * Light is traveling at an angle of 42° in water. What is its angle in air?
- Light is traveling at an angle of 55° in water. What is its angle in air?

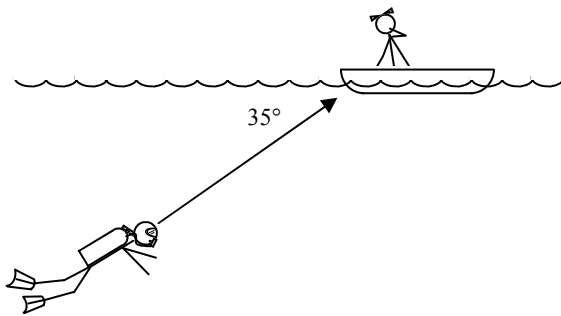
Why did you get an error? Because sin can never be bigger than 1. So, 55° is beyond the critical angle for water.

- Now let's say that light is travelling 85° in water. What is its angle in glass?

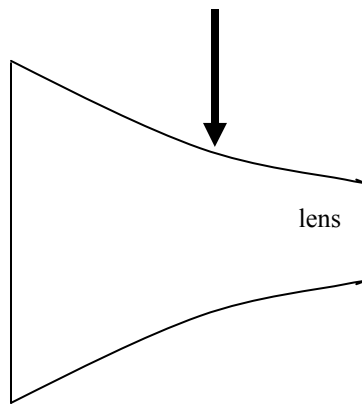
Notice that even at a VERY large angle the light ray bent toward the normal. This is why there is no critical angle when light passes from a fast medium (water, $n = 1.33$) into a slower medium (glass, $n = 1.52$).

- Substance 1 has an index of refraction of 1.68. Substance 2 has an index of refraction of 2.4.
 - In which substance does light travel faster?
 - In which case would there be a critical angle: from substance 1 OR from substance 2?
- * Calculate the critical angle from light as it passes from a diamond to water.

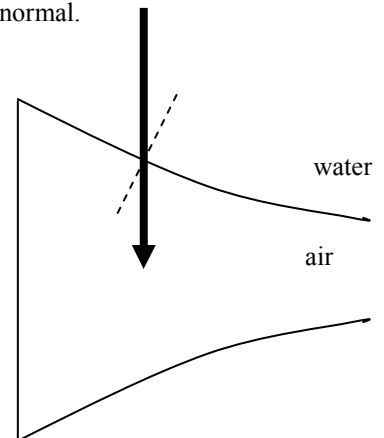
This very small critical angle is why diamonds shine so brilliantly: once the light gets into the diamond, it has a hard time getting out. It bounces around several times, making the diamond "sparkle".



- Slim Jim is also a diver. Jim finds a treasure chest and wants to signal Slim Kim in the boat above. He can see the bottom of the boat poking thru the surface of the sea water (use $n = 1.35$), but he can't see Kim. Why? (And give numbers to prove it.)



- A ray of light is passing from air into a lens. Draw the path of the light ray as it passes into and out of the glass lens. To make this easier at each of the boundaries draw dotted lines for the normal and the straight path. Then decide if the light ray will bend toward or away from the normal.



- But what if the indexes of refraction were reversed? In this example an empty concave tray is placed in water. Using the same procedure as before, determine the path the light ray follows into and out of the tray. Hint: it will be different than in the previous example.

TAKS—

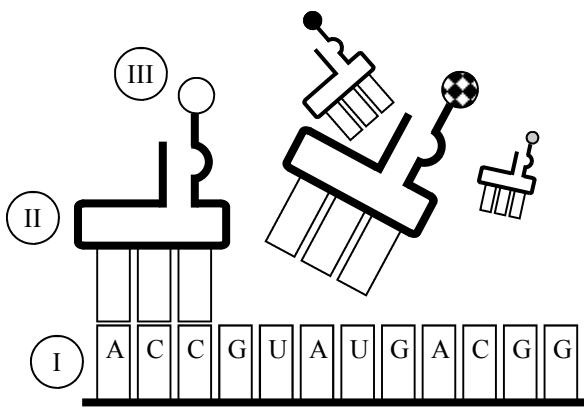
9. (Day 7A) - Autotroph, Heterotroph, or Saprobe?

- A. _____ Eats other organisms.
- B. _____ Makes its own food.
- C. _____ Digests its food outside of its body.
- D. _____ Fungi
- E. _____ Plants
- F. _____ Animals

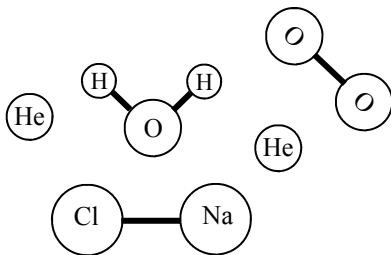
10. Which kingdom or kingdoms?

- A. Have a nucleus; sexually reproduce; can move.
- B. Have no nucleus; can be beneficial.
- C. Can be either unicellular or multicellular.
- D. Autotrophic; have cell walls; multi-cellular.
- E. Can be plant-like (but with no cell wall) or animal-like.
- F. Can live without oxygen or in extreme heat.
- G. Funded Christopher Columbus' four voyages to the Americas.

11. (Day 9) The following shows a part of protein synthesis. You will need the codon chart.



- A. The long strand of genetic materials (Circle I) is DNA, mRNA or tRNA?
- B. The genetic material labeled II is DNA, mRNA or tRNA?
- C. Circle III at the top of the four strangely shaped objects will make a chain. Each of them is an a _____ and together they will make a p _____.
- D. The group of three nucleotides is called a c _____.
- E. Reading from the left, write the complementary nucleotides in the given blanks for the two large tRNA molecules.
- F. A codon chart gives the names of the amino acids that will be chained together. These codons are read from the mRNA not the tRNA. Give the four amino acids that will be read from this portion of the mRNA strand.



- 12. The diagram at the left shows a number of different atoms, elements, molecules, and compounds. Black lines connecting circles indicate molecular bonds. (Day 14, 16, 17 and 20)
- A. (Day 14) How many atoms are there?
- B. How many molecules are there?
- C. How many compounds are there?
- D. How many elements are there?
- E. (Day 16) Identify any metals.

- F. Why is are the He (known as _____) circles not combined with others?
- G. How many protons and electrons does He have?
- H. How many valence electrons does Na have?
- I. (Day 17) Identify any ionic compounds.
- J. Why is the Na and Cl combined in a one-to-one ratio?
- K. (Day 20) Which side of the Na-Cl molecule will be attracted to the O of the water molecule?
- L. If the Na-Cl molecule is mixed into a great number of water molecules, what will happen?