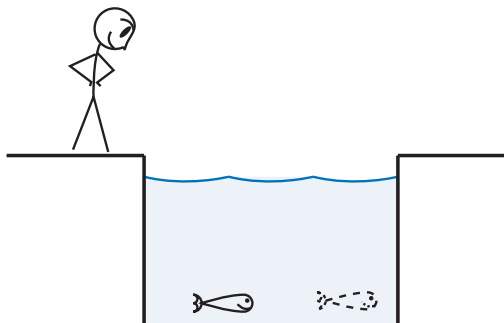


Physics 106 - How Things Work II - Spring 2008

Problem Set #5

1. Describe the difference between blackbody radiation and light that is emitted by discharge lamps, such as a neon sign.
2. An electromagnetic wave passes from air into water, which has an index of refraction of about 1.33. In the air, the electromagnetic wave has a wavelength of 5×10^{-7} m.
 - a. What is the wavelength of the wave in the water? Show your work.
 - b. What is the frequency of the wave in the water? Explain *briefly* your answer.
3. When astronauts walk on the surface of the moon, they can see the stars even when the sun is overhead. Why can't we see the stars when the sun is overhead?
4. Why can you see your reflection in a calm pool of water?
5. When two sheets of glass lie on top of one another, you can often see colored rings of reflected light. How do the nearby glass surfaces cause these colored rings?

6. The person depicted in the figure on the right is looking into a fish pond at a fish. They perceive the fish to be in the location indicated by the fish drawn with dashed lines. The actual location of the fish is indicated by the fish drawn with solid lines. Explain *briefly* why it is that they see the fish in a location that is different from where the fish actually is. You may assume that the ripples in the pond are small enough that they do not affect the problem.



7. A ${}_{54}^{133}\text{Xe}$ nucleus undergoes beta decay. What is the atomic number of the resulting nucleus? Explain your answer.
8. A ${}_{92}^{235}\text{U}$ nucleus undergoes fission, resulting in two nuclei as well as a three neutrons. One of the resulting nuclei has an atomic number of 55. What is the atomic number of the other nucleus? Explain your reasoning.