Assignment: Introduction to Refraction

(textbook pp. 515-519)

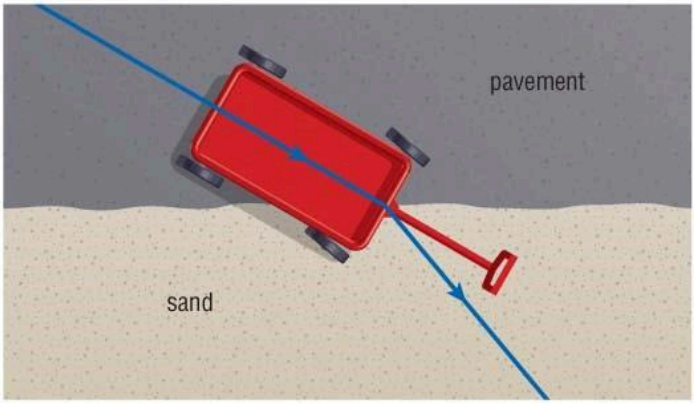
1. How does refraction affect the way that light travels?

Light will no longer travel in a straight line, but change its direction

2. In what situation does refraction occur? What property of light is changed for refraction to occur?

Refraction occurs when light travels from one medium into another medium with different optical density. When this happens, the speed of light is affected - it either slows down or speeds up.

3. In the picture to the right, a wagon moves from pavement into sand. How do each of the two surfaces affect the speed of the wagon? In your own words, explain why the wagon turns in the direction shown.

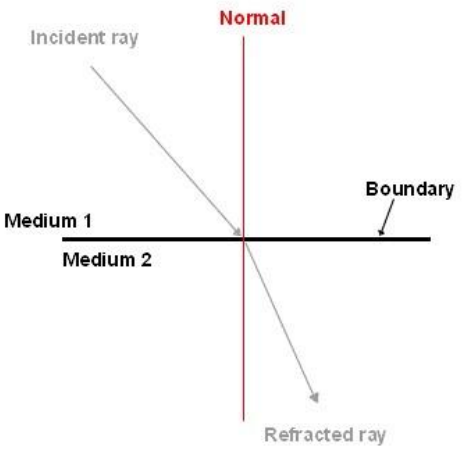


Fast on pavement, slow in sand.
The front right wheel reaches the sand first and slows down, while the wheels on the left continue traveling at the same speed, which causes the wagon to turn

If we were to compare the wagon illustration above to the refraction of light, what material might be represented by pavement? What material might be represented by sand? Briefly explain your answer.

Pavement - a material like air, in which light travels quickly; san - a material like water or glass, in which light travels slowly.

4. The figure to the right represents a beam of light going from one medium to another. One medium is ice, in which light has a speed of 2.29 x 10^8m/s. The other is air, in which light has a speed of 3.0 x 10^8 m/s. Identify which medium is ice and which is air. Explain.



Medium 1 is air, and medium 2 is ice. Since the light ray must slow down when it enters the ice, it will bend towards the normal.

5. Which way will light bend relative to the normal if it speeds up when entering a medium? Which way will light bend if it slows down upon entering a medium?

Speeds up - bends away from the normal
Slows down - bends towards the normal

6. What is partial reflection? Explain one application of partial reflection, or one situation in which partial reflection occurs.

When a material allows some of the light to be transmitted (but refracted), and reflects the rest of the light;
Application: interrogation rooms (bright inside, dark outside)
Situation: Outside a window looking in on a sunny day.

7. Explain why a straw appears bent when placed in a glass of water. You may want to make a simple sketch using Insert - Drawing - New in Google Docs. (If you need some help, see the video lesson or read “The Bent Spoon” on p. 517)

Do you think the straw would be bent more or less if the glass were filled with syrup instead of water? Explain your reasoning.

Syrup is more optically dense than water - light would travel more slowly in syrup than in water. So light reflected from the spoon would bend more in traveling from syrup to air than from water to air.

This means that the straw would probably be bent more. Give this a try on different liquids!