

LIGHT WORKSHEET

1. Below are monochromatic light rays traveling through three substances A, B, and C.

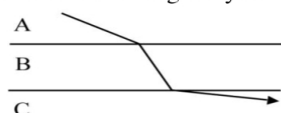


Figure 1

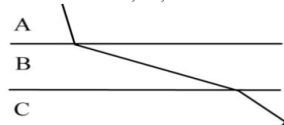


Figure 2

a. Rank the speed of light in each of the materials from fastest to slowest.

Figure 1: 1st ___ 2nd ___ 3rd ___

Figure 2: 1st ___ 2nd ___ 3rd ___

b. Rank the index of refraction of each of the materials from highest to lowest.

Figure 1: 1st ___ 2nd ___ 3rd ___

Figure 2: 1st ___ 2nd ___ 3rd ___

c. Rank the wavelength of the light in each of the materials from longest to shortest.

Figure 1: 1st ___ 2nd ___ 3rd ___

Figure 2: 1st ___ 2nd ___ 3rd ___

d. Rank the frequency of the light in each of the materials from highest to lowest.

Figure 1: 1st ___ 2nd ___ 3rd ___

Figure 2: 1st ___ 2nd ___ 3rd ___

2. What is the speed of light in fused quartz?

3. Dinah Might wants to hide a piece of crown glass, and finds a chemical in which the speed of light is 1.97×10^8 m/s. Will this chemical work?

4. Red light's wavelength in air is 6.0×10^{-7} m and in an unknown chemical it is 3.76×10^{-7} m.

- a. What is the index of refraction of the chemical?
- b. What is the frequency of the light in the air and in the chemical?

5. A ray of light in air strikes the surface of a liquid at an angle of 65° with the normal. The refracted ray is at an angle of 42° with the normal. What is the index of refraction of this liquid?

6. Lead (II) oxide is commonly added to glass to increase its index of refraction. A typical leaded glass has an index of refraction of 1.81. What is the angle of refraction of a light ray in air that is incident on this type of glass at an angle of 32.5° ?

7. The index of refraction of the polycarbonate plastic from which CDs and DVDs are made is 1.55. What is the speed of light as it passes through the plastic?

8. A layer of the solvent toluene is floating on water in a glass container. A ray of light passing through the water is incident upon the toluene layer at an angle of 58.3° . The angle of the refracted beam in the toluene is 49.0° . Calculate the index of refraction of toluene.

9. A ray of light passing through water enters a different material at an incident angle of 27.4° and is refracted so that the angle of refraction is 31.5° . Is the speed of light in the material faster or slower than the speed of light in water? Explain your answer and show your reasoning in mathematical form.

10. A certain ray of green light has a wavelength of 5.40×10^{-7} m in air. What is the wavelength of this light as it passes through a diamond?

11. What is the critical angle for a light ray passing into air from polystyrene plastic, $n_{\text{polystyrene}} = 1.60$?

12. The critical angle of a material is 45.0° . What is the index of refraction of this material?

13. Light in water hits the boundary between water and corn oil at an angle of 35.0° to the boundary. Calculate the angle of refraction.