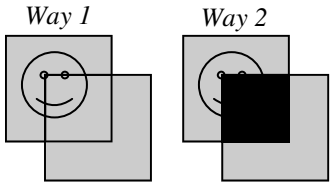
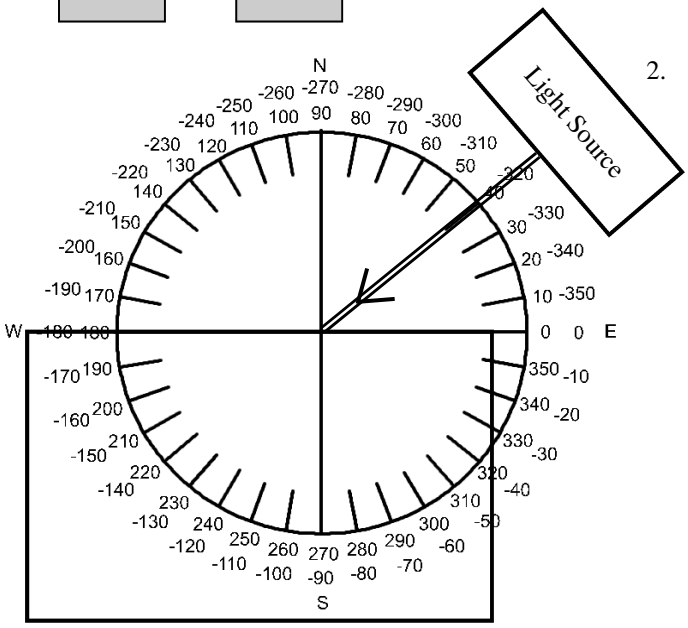
# PreAP Light and Optics 8




1. Two polarizers are placed over a happy face.
   A. In which situation is one of the polarizers turned 90°?

   B. Does this show the wave or particle property of light?




2. White light is projected into a transparent substance. For this substance the index of refraction of blue light (450 nm) is 1.4 and the index of refraction of red light (720 nm) is 1.3.

   A. * Calculate the speed of blue light in the transparent substance.

   B. * Calculate the wavelength of blue light in the transparent substance.

   C. What is the angle of incident (in air) as the light crosses into the substance.

   D. * Calculate, draw and label the angle of refraction for blue light in the transparent substance.

   E. Calculate the frequency of red light in the transparent substance.

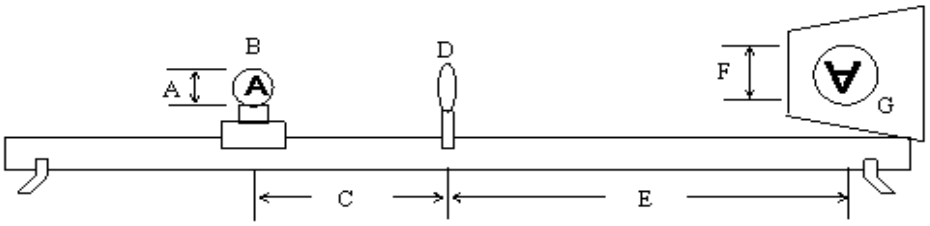
   F. * Calculate, draw, and label the angle of refraction for red light in the transparent substance.

   G. * Which bent more: red or blue light?

*From your "Lens/Mirror Equation and Magnification" notes*:

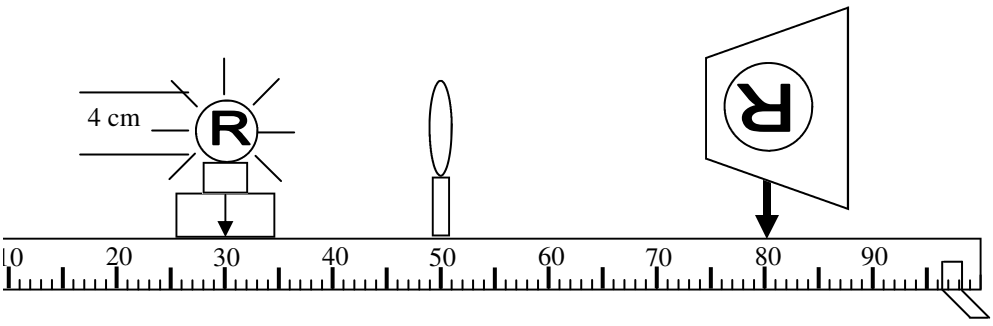
3. A. Label the diagram with p, q, h, and h'. Be sure to mark them with + or –.
   B. Is the image real or virtual?
   C. Why?

   D. Will the magnification be a positive or negative number?




4. From the diagram (use centimeters):
   A. p = q = h =
   B. * Calculate the focal length of this lens.

   C. Calculate the magnification.



*For the next question, I will give you all of the numbers and calculations. This way you can focus on the concepts.*

5. A metallic photocell has a work function of 3.5 eV (which corresponds to a photon of $8.45\times10^{14}$ Hz).
   A light source is incident on the photocell which photons of 4 eV ($9.65\times10^{14}$ Hz).
   A. * What is the threshold frequency of the photocell?
   B. * How much energy is necessary to get each electron out of the surface of the metal?
   C. * Do electrons get ejected from the metal?
   D. * Is the wavelength of the incoming photon longer or shorter than the threshold frequency photon?
   E. * How much excess KE do any ejected electrons have?

6. A metallic surface has 450 nm light incident on it. The work function of the surface is 2.5 eV.
   A. * Calculate the threshold frequency for this surface.

   B. Decide if electrons will be ejected from the surface. If no, how much more energy would be necessary.
   If yes, how much kinetic energy do the ejected electrons have?

2A) v = c/n = 2.14E8 m/s  2B) find freq first 3.21E-7 m
3D) Snell's law: $\theta_2$ = 33.2 degrees  3F) $\theta_2$ = 36.1 degrees  3G) which bent MORE toward the normal?

4A) p = 20 cm  q = 30 cm  4B) 12 cm use the 1/p + 1/q equation.

5A) $8.45\times10^{14}$ Hz  5B) 3.5 eV (how much "to get up the ramp")  5C) Yes, 4eV is > 3.5 eV.
5D) shorter, since ↓λ = ↑f = ↑E.  5E) 4 – 3.5 = 0.5 eV left over.
6A) 6.03E14Hz  6B) figure it out.