

Physics 114 - Fall 2015 – Module 11

1. A beam of light is a mixture of polarized light and unpolarized light. When it is sent through a Polaroid sheet (a linearly polarizing sheet), it is found that the transmitted intensity can be varied by a factor of five depending on the orientation of the Polaroid sheet. Find the relative intensities of the two components of the incident beam.

2. An electromagnetic wave is described by

$$\vec{E} = E_0 \sin(kx - \omega t) \hat{j} + E_0 \cos(kx - \omega t) \hat{k}$$

What direction does this wave propagate? What is the polarization of this wave?

Can you write an equation for a wave that has linear (circular) polarization? (Choose whichever you believe the equation above is *not*.)

3. You hold two thin, converging lenses. One is thicker in the middle than the other. Which has the longer focal length? Explain.
4. Two thin lenses with a focal length of magnitude 10.0 cm, the first converging and the second diverging, are placed 8.0 cm apart. An object 2.00 mm tall is placed 18.0 cm to the left of the first (converging) lens. A) How far from this first lens is the final image formed? B) Is the final image real or virtual? C) Is the final image erect or inverted? What is the height of the image?
5. When a converging lens is immersed in water, does its focal length increase or decrease in comparison with the value in air? Explain and make a drawing showing how the angles of the rays at the interfaces vary in the two cases.
6. If you have normal vision, you can't see clearly underwater without a mask or goggles. Why is this? Why can you see clearly with a mask or goggles? Instead of goggles, could you just wear eyeglasses? If so, should the lenses of the eyeglasses be converging or diverging?
7. Where is the near point of an eye for which a contact lens with a power of +2.75 diopter is prescribed?
8. The focal length of the eyepiece of a certain microscope is 2.50 cm. The focal length of the objective is 16.0 mm. The distance between objective and eyepiece is 22.6 cm. The final image formed by the eyepiece is at infinity. Treat all lenses as thin. a) What is the distance from the objective to the object being viewed? B) What is the magnitude of the linear magnification produced by the objective? C) What is the overall magnification of the microscope?