Workshop module 7 - Physics 123, Spring 2013

1. You hold two thin, converging lenses. One is thicker in the middle than the other. Which has the longer focal length? Explain.

2. 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?

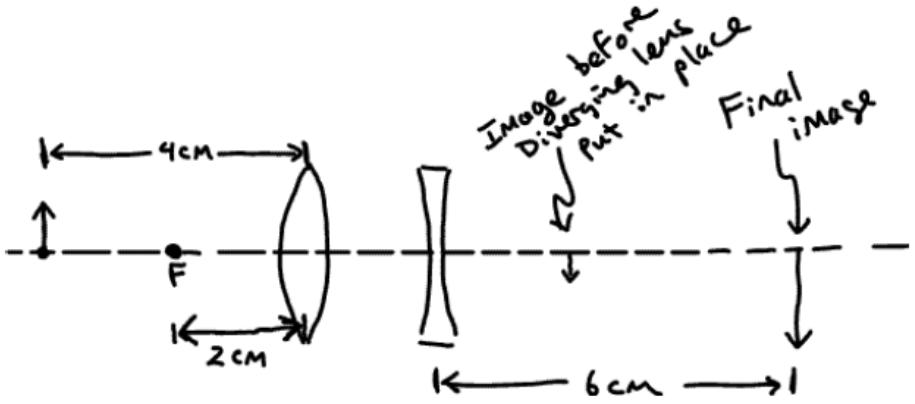
3. When a converging lens is immersed in water, does its focal length increase or decrease in comparison with the value in air? Explain and make a drawing showing how the angles of the rays at the interfaces vary in the two cases.

4. 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?

5. Where is the near point of an eye for which a contact lens with a power of +2.75 diopter is prescribed?

6. 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?

7. An object placed 4 cm to the left of a converging lens of focal length 2 cm produces an image 4 cm to the right of the lens. A diverging lens placed at the focal point of the converging lens as shown in the sketch produces a final image 6 cm to the right of the diverging lens. Determine the focal length of the
diverging lens.



8. A ray of light is traveling in a glass cube that is totally immersed in water. You find that if the ray is incident on the glass-water interface at an angle to the normal greater that 48.7 degrees, no light passes from the glass to the water (no light is refracted into the water in physics-speak). What is the refractive index of the glass. (Assume the refractive index of water is 1.33.)

9. A beam of polarized light is sent through a system of two polarizing sheets. Relative to the polarization direction of that incident light, the polarizing directions fo the sheets are at angles θ for the first sheet and 90 degrees for the second sheet. If 10% of the incident intensity is transmitted by the two sheets, what is θ?

10. An "air prism" is immersed in water. A ray of monochromatic light strikes one face as shown. Which is the ray of light in the sketch that best represents the path you think the light would take as it emerges from the air prism.