

CH19

6. ||| In **Figure P19.6** the camera lens has a 50 mm focal length. How high is the man's well-focused image on the CCD detector?

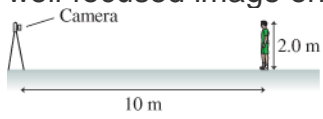


Figure P19.6

12. | The near point for your myopic uncle is 10 cm. Your own vision is normal; that is, your near point is 25 cm. Suppose you and your uncle hold dimes (which are 1.7 cm in diameter) at your respective near points.

- a. What is the dime's angular size, in radians, according to you?
- b. What is the dime's angular size, in radians, according to your uncle?
- c. Do these calculations suggest any benefit to near-sightedness?

20. ||| A standard biological microscope is required to have a magnification of 200x.
- a. When paired with a 10x eyepiece, what power objective is needed to get this magnification?
 - b. What is the focal length of the objective?

24. || For the combination of two identical lenses shown in **Figure P19.24**, find the position, size, and orientation of the final image of the 2.0-cm-tall object.

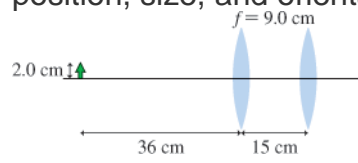


Figure P19.24

32. ||||| A ray of red light, for which $n = 1.54$, and a ray of violet light, for which $n = 1.59$, travel through a piece of glass. They meet right at the boundary between the glass and the air, and emerge into the air as one ray with an angle of refraction of 22.5° . What is the angle between the two rays in the glass?

34. | A 1.0-cm-diameter microscope objective has a focal length of 2.8 mm. It is used in visible light with a wavelength of 550 nm.

- a. What is the objective's resolving power if used in air?
- b. What is the resolving power of the objective if it is used in an oil-immersion microscope with $n_{\text{oil}} = 1.45$?

42. || A lens with a focal length of 25 cm is placed 40 cm in front of a lens with a focal length of 5.0 cm. How far from the second lens is the final image of an object infinitely far from the first lens? Is this image in front of or behind the second lens?

44. || Your task in physics lab is to make a microscope from two lenses. One lens has a focal length of 10 cm, the other a focal length of 3.0 cm. You plan to use the more powerful lens as the objective, and you want its image to be 16 cm from the lens, as in a standard biological microscope.

- a. How far should the objective lens be from the object to produce a real image 16 cm from the objective?
- b. What will be the magnification of your microscope?