# Chapter 17

## Terms

Be able to define or discuss the following terms and ideas, with their SI units if appropriate.

1. converging lens
2. diverging lens
3. biconcave lens
4. biconvex lens
5. radius (of a a lens surface)
6. lensmaker's formula (for thin lenses in air)
7. focal point
8. focal length
9. sign conventions for thin lenses
10. object distance
11. image distance
12. linear magnification
13. optics of a camera; what it means "to focus" a camera
14. optics of a human eye
15. farsighted
16. nearsighted
17. far point (for a healthy eye)
18. far point (for a nearsighted eye)
19. near point (for a healthy eye)
20. near point (for a farsighted eye)
21. refractive power of lens (in units of diopters)
22. angular magnification
23. magnifying glass
24. telescope (made of lenses and called a *refractor* to distinguish it from telescope that use mirrors)
25. microscope
26. objective (lens)
27. eyepiece (lens)

## Equations

Understand the meaning and know the SI units of all symbols in these equations; know how to perform each mathematical operation, such as trig functions; know how to solve for any unknown quantity; understand how changing one quantity affects another quantity (if all other quantities remain constant); be able to apply one or more equations to solve a problem.

- image for a thin lens

$$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f} \tag{1}$$

- refractive power (i.e. optical power)

$$\text{Refractive Power} = \frac{1}{f} \qquad \text{where f is in meters} \tag{2}$$

- angular magnification

$$MP = \frac{N}{s_o} \tag{3}$$

## Skills

1. Know the sign conventions for thin lenses.
2. Know how the radius of a lens affects its focal length.
3. Know how to trace rays for converging and diverging lens and how to predict where an image will be formed.
4. Know the optics for a farsighted eye and how to calculate the focal length of a corrective lens.
5. Know the optics for a nearsighted eye and how to calculate the focal length of a corrective lens.
6. Know how to design a refractive telescope and how to calculate its magnification.
7. Know how to design a compound microscope and how to calculate the distance between the objective and eyepiece.

## Lab Skills

1. Measure the focal length of a converging lens.
2. Design and construct a refractive telescope that has the desired magnification.