Chapter 23: Ray model of light, reflection, and refraction

1. Be able to describe the ray model for light and the phenomena that it can account for.
2. Be able to explain how we can determine the location of a source of light with our visual system.

Reflection

3. Be able to use the rule for reflection with light rays and mirrors, including identifying the angle in incidence and the angle of reflection.
4. Be able to describe what an image is and why we see it at a specific location.
5. Using several rays, be able to explain how a plane mirror forms an image of a point source of light.
6. On a diagram be able to mark the location of an image formed by a flat mirror with respect to the object and the mirror.
7. Be able to describe what the principle axis and the focus of a curved mirror are.
8. Be able to describe how to find the focus of a converging or a diverging mirror using parallel rays.
9. Be able to explain how parabolic reflectors work in transmitters and collectors such as searchlights, satellite dishes, etc.
10. Be able to use the parallell, focal, and central rays of light from a specific point on an object to determine the position of its image when formed by a mirror.
11. Be able to describe what a real focus is, what a virtual focus is, what a real image is, and what a virtual image is.
12. Be able to calculate the unknown among f, d_i, and d_o in $\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$, noting when the focal length and the image distance is positive or negative.

Refraction

13. Be able to describe what is meant by the angle of refraction.
14. Be able to sketch a diagram that shows a ray of light travel from one material into another material and to label the angle of incidence, the angle of refraction, and to determine which of the two angles will be bigger, given the indices of refraction of the two materials.
15. Be able to determine the index of refraction for a material given the angles of incidence and refraction of a light ray.

16. Be able to state the conditions under which there will be total internal reflection.

17. Be able to find the critical angle for an appropriate pair of optical materials.

18. Be able to use Snell's Law to describe the relationship between incident and reflected rays.

19. Be able to describe how to find the foci of a converging and diverging lenses using parallel rays.

20. Be able to use the parallel, focal, and central rays of light from a specific point on an object to determine the position of its image formed by a lens.

21. Be able to use the Gaussian lens formula, $\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$, to determine the position and size of an image and to determine whether the image is real or virtual.

22. Be able to describe how to use a magnifying glass, including the kind of lens needed and the positioning of object, image, and observer.