

Chapter 30 Lenses

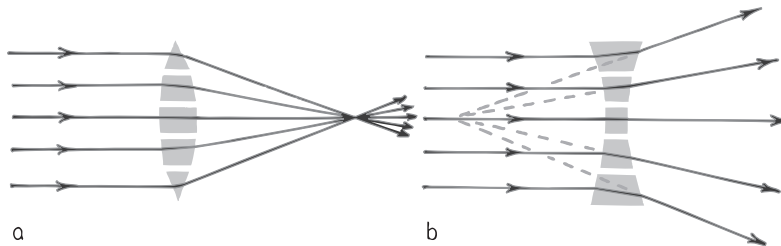
# Exercises

## 30.1 Converging and Diverging Lenses (pages 603–604)

1. A(n) \_\_\_\_\_ is a piece of glass or plastic that refracts light.
2. Describe how a lens is able to form images.  
\_\_\_\_\_  
\_\_\_\_\_

3. Is the following sentence true or false? A converging lens is also known as a concave lens. \_\_\_\_\_
4. A converging lens is \_\_\_\_\_ in the middle.
5. A(n) \_\_\_\_\_ lens causes rays of light that are initially parallel to meet at a single point.
6. A diverging lens is also known as a(n) \_\_\_\_\_ lens.

Use the illustration below to answer Questions 7 and 8.



7. The lens on the left is a(n) \_\_\_\_\_ lens.
8. Is the following sentence true or false? The lens on the right causes rays to appear as if they come from a single point. \_\_\_\_\_

Match each term to its definition.

Term	Definition
_____ 9. principal axis	a. line joining the centers of curvature of a lens
_____ 10. focal point	b. distance between the center of the lens and its focal point
_____ 11. focal plane	c. plane perpendicular to the principal axis that passes through either focal point
_____ 12. focal length	d. location where a beam of light parallel to the principal axis converges

13. Is the following sentence true or false? A lens has two focal points and two focal planes. \_\_\_\_\_

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#### 30.2 Image Formation by a Lens (pages 604–606)

14. Is the following sentence true or false? When you are closer to an object, you view it through a smaller angle of view. \_\_\_\_\_

15. Explain how the angle of view of a lens is related to magnification.

\_\_\_\_\_

\_\_\_\_\_

16. Circle the letter of each factor that affects the type of image formed.

- a. shape of lens
- b. type of object observed
- c. position of lens
- d. how object is illuminated

17. A converging lens only forms magnified images when the object is located between the \_\_\_\_\_ and the \_\_\_\_\_.

18. A small handheld magnifying lens is used to view an insect. Explain what will be seen if a white screen is placed at the location of the enlarged focused image of the insect.

\_\_\_\_\_

\_\_\_\_\_

19. Is the following sentence true or false? A converging lens cannot form an image that can be projected onto a wall. \_\_\_\_\_

20. Circle the letter of each characteristic that describes the image formed when light originating from an object that is far from a converging lens passes through the lens.

- a. virtual
- b. formed by converging light rays
- c. upside down
- d. can be projected on a wall

21. Circle the letter of each characteristic that describes the image formed by a diverging lens.

- a. virtual
- b. smaller than object
- c. upside down
- d. formed by converging light rays

22. Is the following sentence true or false? A diverging lens forms images only when the object is located between the lens and the focal point.

\_\_\_\_\_

23. Why are diverging lenses often used in the viewfinder of cameras?

\_\_\_\_\_

\_\_\_\_\_

#### 30.3 Constructing Images Through Ray Diagrams

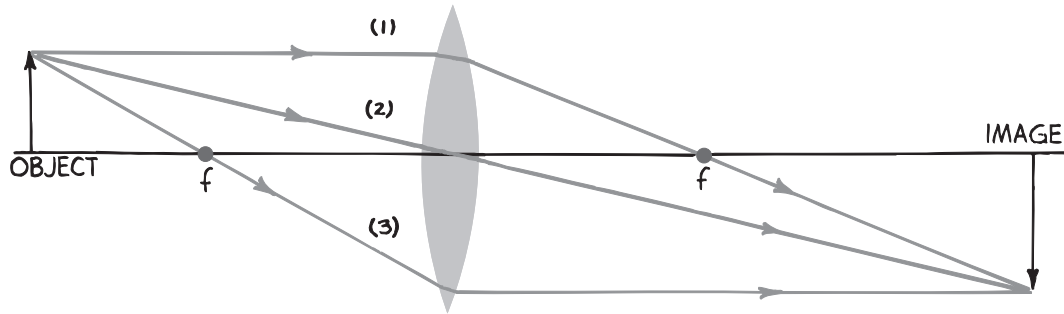
(pages 606–609)

24. What is a ray diagram?

\_\_\_\_\_

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Use the illustration below to answer Questions 25–28. The illustration shows several rays from an object passing through a convex lens.



25. Circle the letter of the ray that travels parallel to the principal axis and is then refracted by the lens through the focal point.
  - a. ray (1)
  - b. ray (2)
  - c. ray (3)
  - d. ray (1) and ray (3)
26. Circle the letter of the ray that passes through the focal point and is then refracted parallel to the principal axis.
  - a. ray (1)
  - b. ray (2)
  - c. ray (3)
  - d. ray (1) and ray (3)
27. Circle the letter of the ray that is not refracted in any significant way.
  - a. ray (1)
  - b. ray (2)
  - c. ray (3)
  - d. ray (1) and ray (3)
28. Circle the letter of each statement about the image formed that is true.
  - a. The image is upside down.
  - b. The image is virtual.
  - c. The image is real.
  - d. The image is formed by converging rays.
29. Is the following sentence true or false? Ray diagrams cannot be drawn for diverging lenses because the lenses cause light rays to spread apart.  
\_\_\_\_\_
30. Is the following sentence true or false? Ray diagrams can be used to determine the size and location of real and virtual images. \_\_\_\_\_

### 30.4 Image Formation Summarized (page 610)

31. Identify each type of lens capable of forming a real image.  
\_\_\_\_\_
32. Identify each type of lens capable of forming a virtual image.  
\_\_\_\_\_

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33. Circle the letter that describes the image formed when a converging lens is used as a magnifying glass.
- a. real, magnified, and upside down
  - b. real, magnified, and upright
  - c. virtual, reduced in size, and upright
  - d. virtual, magnified, and upright
34. Describe the characteristics of an image formed by a diverging lens.
- \_\_\_\_\_
- \_\_\_\_\_
35. Circle the letter of the required location of an object in front of a diverging lens such that the lens forms a virtual image.
- a. less than  $f$
  - b. at  $f$
  - c. beyond  $f$
  - d. anywhere

**30.5 Some Common Optical Instruments (pages 610–612)**

36. Circle the letter of each optical instrument that uses lenses.
- a. camera
  - b. binoculars
  - c. microscope
  - d. telescope
37. Is the following sentence true or false? A camera's diaphragm controls the size of the opening the light passes through. \_\_\_\_\_
38. Describe the function of the eyepiece lens in a telescope.
- \_\_\_\_\_
- \_\_\_\_\_
39. Is the following sentence true or false? When looking through a telescope, you see an image of an image. \_\_\_\_\_
40. Circle the letter of the optical instrument most closely related to binoculars.
- a. camera
  - b. terrestrial telescope
  - c. microscope
  - d. astronomical telescope
41. Circle the letter that best describes a compound microscope.
- a. uses lenses to form enlarged images
  - b. uses two converging lenses to form magnified images of faraway objects
  - c. uses two converging lenses to form magnified images of close objects
  - d. uses diverging lenses to create enlarged virtual images
42. Describe the function of the objective lens in a compound microscope.
- \_\_\_\_\_

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**30.6 The Eye (pages 612–613)**

*Match each term to its definition.*

Term	Definition
_____ 43. cornea	a. light-sensitive layer
_____ 44. iris	b. regulates the amount of light entering the eye
_____ 45. pupil	c. region of retina with no vision
_____ 46. retina	d. transparent covering of the eye
_____ 47. fovea	e. region of retina with clearest vision
_____ 48. blind spot	f. the opening in the eyeball through which light passes

49. Describe how the eye changes its focus.

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**30.7 Some Defects in Vision (pages 614–615)**

50. Circle the letter of the reason a farsighted person has trouble focusing on nearby objects.

- a. images form in front of retina    b. no images form  
 c. iris opening too small            d. eyeball too short

51. A \_\_\_\_\_ person does not see distant objects clearly.

52. Is the following sentence true or false? Images formed by someone who is nearsighted form in front of the retina. \_\_\_\_\_

53. Describe the shape of the cornea that results in astigmatism.

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*Match each vision defect to its corrective remedy.*

Defect	Remedy
_____ 54. nearsightedness	a. converging lenses
_____ 55. farsightedness	b. lenses with uneven curvature
_____ 56. astigmatism	c. diverging lenses

**30.8 Some Defects of Lenses (pages 615–616)**

57. What is an aberration?

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58. \_\_\_\_\_ aberration occurs when light passing through the edges of a lens does not focus in the same location as light that passes through the center of the lens.

59. \_\_\_\_\_ aberration is caused by light of different colors traveling at different speeds.