

Chapter 30 Lenses

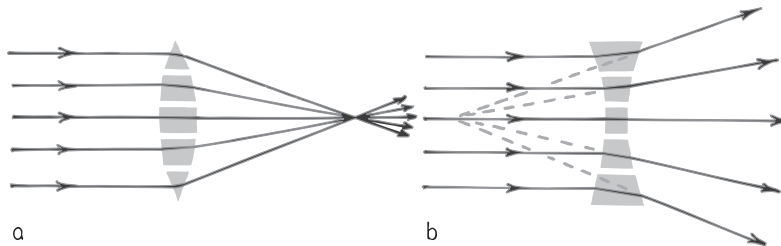
Exercises

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. _____

Chapter 30 Lenses

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.

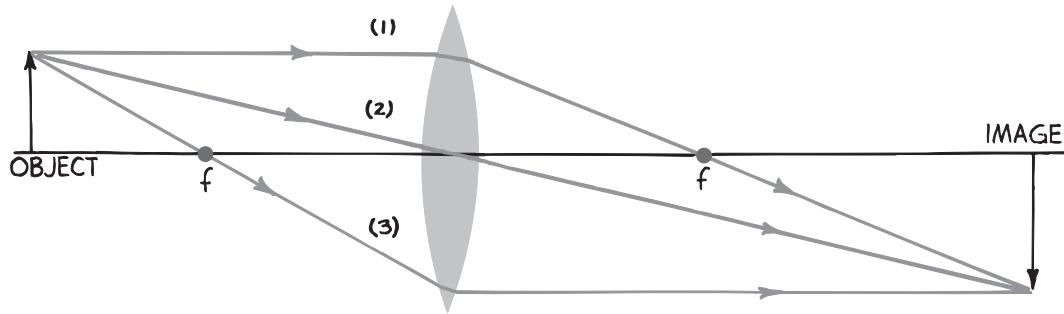
23. Why are diverging lenses often used in the viewfinder of cameras?

30.3 Constructing Images Through Ray Diagrams (pages 606–609)

24. What is a ray diagram?

Chapter 30 Lenses

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.

Chapter 30 Lenses

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

Chapter 30 Lenses

30.8 Some Defects of Lenses (pages 615–616)

57. What is an aberration?

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.