chapter 25 REFLECTION OF LIGHT: MIRRORS

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◻ 5. Daniel walks directly toward a plane mirror at a speed of 0.25 m/s. Determine the speed of the image *relative to him*.
   (a) 0.13 m/s   (c) 0.50 m/s   (e) 1.0 m/s
   (b) 0.25 m/s   (d) 0.75 m/s

■ 6. Five balls labeled **A**, **B**, **C**, **D**, and **E** are placed in front of a plane mirror as shown in the figure. Which ball(s) will the observer see reflected in the mirror?
   (a) **A** only
   (b) **C** only
   (c) **A** and **B**
   (d) **A**, **B**, **D** and **E**
   (e) **A**, **B**, **C**, **D** and **E**

Plane mirror

A●   B●   C●

D●   E●
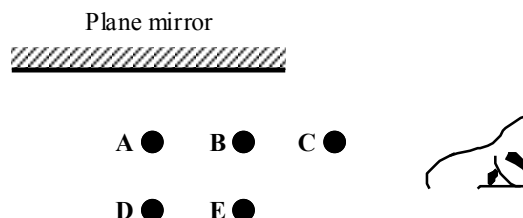
Section 25.4 Spherical Mirrors
Section 25.5 The Formation of Images by Spherical Mirrors

Only the left eye is closed.

◻ 13. The focal length of a spherical concave mirror is 20 cm. What is its radius of curvature?
   (a) 5 cm   (c) 20 cm   (e) 50 cm
   (b) 10 cm   (d) 40 cm

◼ 14. The radius of curvature of a spherical convex mirror is 52 cm. What is its focal length?
   (a) +26 cm   (c) +52 cm   (e) +104 cm
   (b) −26 cm   (d) −52 cm

◼ 15. Which one of the following statements concerning a convex mirror is true?
   (a) A convex mirror can form a real image.
   (b) A convex mirror must be spherical in shape.
   (c) The image produced by a convex mirror will always be inverted relative to the object.
   (d) A convex mirror produces a larger image than a plane mirror does for the same object distance.
   (e) The image a convex mirror produces is closer to the mirror than it would be in a plane mirror for the same object distance.

◼ 16. A concave mirror has a radius of curvature of 30.0 cm. How close to the mirror should an object be placed so that the rays travel parallel to each other after reflection?
   (a) 10.0 cm   (c) 30.0 cm   (e) 60.0 cm
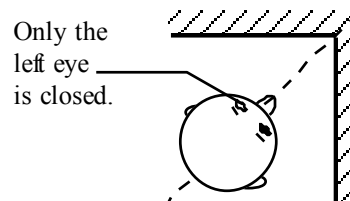
(b) 15.0 cm   (d) 45.0 cm

Questions 20 through 22 pertain to the system described below:

An object is placed in front of a concave spherical mirror as shown below. The three rays **1**, **2**, and **3**, leave the top of the object and, after reflection, converge at a point on the top of the image. Ray **1** is parallel to the principal axis, ray **2** passes through *F*, and ray **3** passes through *C*.
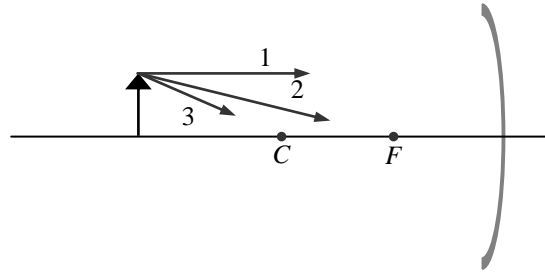
20. Which ray(s) will pass through *F* after reflection?
    (a) **1** only   (c) **3** only   (e) **1, 2,** and **3**
    (b) **2** only   (d) both **1** and **2**

21. Which ray(s) will reflect back on itself (themselves)?
    (a) **1** only   (c) **3** only   (e) **1, 2,** and **3**
    (b) **2** only   (d) both **1** and **2**

22. Which one of the following groups of terms best describes the image?
    (a) real, upright, enlarged   (d) real, inverted, enlarged
    (b) real, inverted, reduced   (e) virtual, inverted, reduced
    (c) virtual, upright, enlarged

Section 25.6 The Mirror Equation and the Magnification Equation

23. A concave mirror in an amusement park has a radius of curvature of 4.0 m. A child stands in front of the mirror so that she appears 2.5 times taller than her actual height. If the image is upright, how far is she standing from the mirror?
    (a) 1.2 m   (c) 2.8 m   (e) 7.0 m
    (b) 3.5 m   (d) 4.0 m

24. A convex mirror in an amusement park has a radius of curvature of 3.00 m. A man stands in front of the mirror so that his image is half as tall as his actual height. At what distance must the man focus his eyes in order to see his image?
    (a) 2.25 m   (c) 4.50 m   (e) 6.75 m
    (b) 3.00 m   (d) 5.00 m

25. A woman stands 2.0 m in front of a convex mirror and notices that her image height is 1/4 of her actual height. Determine the radius of curvature of the mirror.
    (a) 0.67 m   (c) 2.0 m   (e) 6.0 m
    (b) 1.3 m   (d) 4.0 m

26. A concave mirror has a radius of curvature of 20 cm. For which one of the following object distances will the image be real, inverted and smaller than the object?
    (a) 5 cm   (c) 15 cm   (e) 25 cm
    (b) 10 cm   (d) 18 cm

27. An object is 1.0 m in front of a mirror. A virtual image is formed 10.0 m behind the mirror.

What is the radius of curvature of the mirror?
(a) 0.56 m   (c) 2.2 m   (e) 10 m
(b) 1.1 m   (d) 4.4 m

28. The table below lists object and image distances for five objects in front of mirrors. For which one of the following cases is the image formed by a convex spherical mirror?

	Object distance	Image distance
(a)	7.10 cm	18.0 cm
(b)	25.0 cm	16.7 cm
(c)	5.0 cm	−10.0 cm
(d)	20.0 cm	−5.71 cm
(e)	40.0 cm	−80.0 cm

29. An object is placed 30 cm in front of a concave spherical mirror that has a radius of curvature 40 cm. Which one of the following phrases best describes the image?
(a) virtual and located at infinity   (d) virtual and located 60 cm from the mirror
(b) real and located 60 cm from the mirror   (e) virtual and located 120 cm from the mirror
(c) real and located 120 cm from the mirror

30. An object is placed 30.0 cm from a convex spherical mirror with radius of curvature 40.0 cm. Which one of the following phrases best describes the image?
(a) virtual and located at infinity   (d) virtual and located 12 cm from the mirror
(b) real and located 12 cm from the mirror   (e) virtual and located 17 cm from the mirror
(c) real and located 17 cm from the mirror

31. A spherical concave mirror has a radius of curvature of 6.0 cm. At what distance from the mirror should a 6.0-cm object be placed to obtain an image that is 48 cm tall?
(a) 1.3 cm   (c) 4.2 cm   (e) 6.8 cm
(b) 3.6 cm   (d) 5.3 cm

32. A convex mirror has a radius of curvature of 0.50 m. Where must an object be placed in front of the mirror such that the image is formed 0.15 m behind the mirror?
(a) 0.38 m   (c) 0.77 m   (e) 0.57 m
(b) 0.19 m   (d) 0.093 m

33. A concave mirror is found to focus parallel rays at a distance of 9.0 cm. Where is the image formed when an object is placed 6.0 cm in front of the mirror?
(a) 11 cm in front of the mirror   (d) 5.6 cm behind the mirror
(b) 18 cm behind the mirror   (e) 9.2 cm in front of the mirror
(c) 3.6 cm in front of the mirror

34. A rubber ball is held 4.0 m above a concave spherical mirror with a radius of curvature of 1.5 m. At time equals zero, the ball is dropped from rest and falls along the principal axis of the mirror. How much time elapses before the ball and its image are at the same location?
(a) 0.30 s   (c) 0.63 s   (e) 0.90 s
(b) 0.55 s   (d) 0.71 s

35. A 0.127-m pencil is oriented perpendicular to the principal axis of a concave spherical mirror that has a radius of curvature of 0.300 m. What are the image distance and the image height if the pencil is 0.250 m from the mirror?

	Image Distance	Image Height
(a)	0.150 m	−0.076 m
(b)	0.225 m	−0.114 m
(c)	0.250 m	−0.127 m
(d)	0.300 m	−0.152 m

(e)   0.375 m   −0.191 m

◻ 36. A dime is placed in front of a concave mirror that has a radius of curvature $R = 0.15$ m. The image of the dime is inverted and three times the size of the dime. Determine the distance between the dime and the mirror.
   (a) 0.23 m   (c) 0.10 m   (e) 0.038 m
   (b) 0.15 m   (d) 0.075 m

◻ 37. The inverted image of a light bulb is formed on a screen located 9.00 m from a spherical mirror. The image is 4.00 times larger than the light bulb. Determine the object distance and the type of mirror used.
   (a) +0.444 m, concave   (d) +0.0278 m, convex
   (b) +2.25 m, concave   (e) +36.0 m, convex
   (c) +36.0 m. concave

◻ 38. A convex mirror with a focal length of 58 cm is used to form an image that is 29 cm behind the mirror. What is the object distance?
   (a) +22 cm   (c) +69 cm   (e) +58 cm
   (b) +15 cm   (d) +28 cm