Halliday, Resnick, and Walker, *Fundamentals of Physics 10e* Question Answers

Chapter 34 Answers

1	(a) a; (b) c
2	(a) I_1 and I_4; (b) I_2 and I_3; (c) I_3; (d) I_3; (e) I_2
3	(a) a and c; (b) three times; (c) you
4	(a) from infinity to the focal point; (b) decrease continuously
5	convex
6	1 concave, 2 convex, 3 plane
7	(a) all but variation 2; (b) 1, 3, 4: right, inverted; 5, 6: left, same
8	1 converging, 2 diverging
9	d (infinite), tie of a and b, then c
10	(a) I_2 and I_3; (b) I_1 and I_4; (c) I_1; (d) I_1; (e) I_4
11	(a) x; (b) no; (c) no; (d) the direction you are facing

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Halliday/Resnick/Walker Fundamentals of Physics

Classroom Response System Questions

Chapter 34 Images

Reading Quiz Questions

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34.2.1. What are the two types of images?

a) real and imaginary

b) reflected and refracted

c) real and virtual

d) concave and convex

e) superior and sublime

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34.2.2. What type of image does an observer see when the light rays entering his/her eye do not actually emanate from the image?

a) intangible

b) real

c) diffuse

d) virtual

e) incongruent

WILEY

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a) intangible

b) real

c) diffuse

d) virtual

e) incongruent

WILEY

34.3.1. Which one of the following statements is *not* a characteristic of a plane mirror?

a) The image is the same size as the object.

b) The image is always upright.

c) The image is real.

d) The image is reversed left to right compared to the object.

e) The image is the same distance behind the mirror as the object is in front of the mirror.

WILEY

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WILEY

34.4.1. What term is used for the line that passes through the center of curvature of a spherical mirror and the mid-point of the mirror?

a) capitol axis

b) complimentary axis

c) demarcation line

d) reflection line

e) central axis

WILEY

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WILEY

34.4.2. Which of the following expressions applies to a spherical mirror of radius R?

a) $f = \frac{1}{2}R$

b) $f = \frac{3}{4}R$

c) $f = R$

d) $f = \frac{3}{2}R$

e) $f = 2R$

WILEY

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WILEY

34.4.3. Complete the following sentence: The normal to the surface of a spherical mirror is

a) always parallel to the central axis.

b) a line drawn from the center of curvature to the surface of the mirror.

c) parallel to the surface of the mirror.

d) undefined for a spherical mirror.

e) always perpendicular to the central axis.

WILEY

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WILEY

34.4.4. Which one of the following statements is true for a curved mirror?

a) A mirror that is more curved has a larger focal length than that for a less curved mirror.

b) A mirror that is more curved has the same focal length than that for a less curved mirror.

c) A mirror that is more curved has a smaller focal length than that for a less curved mirror.

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WILEY

34.4.5. Which one of the following statements is true concerning a mirror that has a negative focal length?

a) Such a mirror is non-existent.

b) The mirror is convex.

c) The images produced by the mirror are all real images.

d) The mirror is concave.

e) The mirror is somewhat more curved than one with a positive focal length.

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WILEY

34.5.1. An object is placed in front of a concave spherical mirror. Consider the following rays that leave the top of the object and approach the mirror:
(A) a ray that passes through the center of curvature
(B) a ray that passes through the middle of the mirror where the principal axis intersects
(C) a ray that is directed parallel to the principal axis
(D) a ray that passes through the focal point
Which one of these rays, if any, is not used in locating images by drawing rays as described in the text?

a) A

b) B

c) C

d) D

e) All four rays are used.

WILEY

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WILEY

34.5.2. Which of the following parameters is not needed to use the mirror equation to solve for an unknown parameter?

a) the image distance

b) focal length of the mirror

c) the shape of the mirror

d) the height of the object

e) the object distance

WILEY

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d) the height of the object

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WILEY

34.5.3. In which of the following cases is the image virtual?

a) It is on the same side of the mirror as the object.

b) The image is virtual if you can only see it when projected onto a surface.

c) The lateral magnification is negative.

d) The distance from the mirror to the image is greater than the distance from the mirror to the object.

e) None of the cases above produce a virtual image.

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WILEY

34.5.4. In which of the following cases is the image real?

a) It is on the opposite side of the mirror from the object.

b) The image is real if you can project it onto a surface.

c) The lateral magnification is positive.

d) The image is upright (not inverted relative to the object).

e) None of the cases above produce a real image.

WILEY

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e) None of the cases above produce a real image.

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34.5.5. For a certain situation involving an object and a spherical mirror, the resulting lateral magnification is negative. Which of the following properties necessarily may be attributed to the image?

a) real

b) virtual

c) oriented in the same direction as the object

d) oriented in the opposite direction as the object

e) No image can be produced when the lateral magnification is negative.

WILEY

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34.6.1. Which one of the following statements is true concerning the radius of curvature of a concave lens?

a) The radius of curvature for such a lens is positive.

b) The radius of curvature for such a lens is infinite.

c) The radius of curvature for such a lens is zero.

d) The radius of curvature for such a lens is impossible to determine.

e) The radius of curvature for such a lens is negative.

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34.7.1. A ray of light leaves an object and passes through the focal point on the same side of a converging lens. The ray is then incident on the lens. Which one of the following statements correctly describes the subsequent path of the light after it leaves the lens?

a) The ray passes through the focal point on the opposite side of the lens.

b) The ray travels parallel to the central axis.

c) The ray travels along the central axis.

d) The ray passes through the lens undeflected as if the lens were not present.

e) The ray is reflected back on itself through the same focal point.

WILEY

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34.7.2. Light rays parallel to the central axis approach a converging lens. Where do the rays converge?

a) at the center of the lens

b) at infinity

c) at the focal point

d) at a point located two focal lengths from the lens

WILEY

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WILEY

34.7.3. Which one of the following statements concerning diverging lenses is true?

a) The image formed by a diverging lens is larger than the object.

b) The image formed by a diverging lens is inverted relative the object.

c) A diverging lens can be used as a magnifying glass.

d) A diverging lens always forms a virtual image of a real object.

e) Diverging lenses are used in cameras.

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34.7.4. Which one of the following statements concerning converging lenses is false?

a) A ray that passes through the center of the lens will not be significantly deflected by the lens.

b) An object cannot be placed in front of the lens such that a virtual image results.

c) An object can be placed in front of the lens such that a real image results.

d) A paraxial ray that is parallel to the principal axis as it approaches the converging lens will pass through the focal point on the opposite side of the lens.

e) A converging lens is used in a slide or film projector.

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34.7.5. A lens produces a virtual image that is upright relative to the object. What can one infer about this situation?

a) The magnification is greater than one.

b) The magnification is less than one.

c) The lens must be a converging lens.

d) The lens must be a diverging lens.

e) The magnification has a positive value.

WILEY

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34.7.6. Which one of the following is not a parameter used in either the thin-lens equation or the magnification equation?

a) index of refraction of the lens material

b) shape of the lens

c) lens focal length

d) object distance

e) image distance

WILEY

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WILEY

34.7.7. Complete the following statement: When using two lenses in combination,

a) the lenses must both be identical.

b) as in a microscope, the lens closest to the eye is the objective.

c) the image of the first lens becomes the object for the second lens.

d) both lenses must be converging lenses.

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WILEY

34.7.8. In which one of the following cases is a lens considered thin?

a) The thickest part of the lens is small compared to the object distance.

b) The thickest part of the lens is small compared to the image distance.

c) The thickest part of the lens is small compared to the radii of curvature.

d) Choices (a) and (c) are correct, but not choice (c).

e) Choices (a), (b), and (c) are all correct.

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WILEY

34.8.1. Which one of the following statements concerning a compound microscope is false?

a) The distance between the lenses must be greater than the sum of the focal lengths of the lenses.

b) The objective lens is closest to the object being examined under the microscope.

c) The compound microscope utilizes two converging lenses.

d) The final image is large and very close to the eyepiece.

e) The angular magnification is greatest when the focal lengths are as small as possible.

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WILEY

34.8.2. Which one of the following statements concerning an astronomical telescope is false?

a) The eyepiece is also known as the viewfinder.

b) The image produced by the first lens is real and inverted.

c) The eyepiece acts like a magnifying lens.

d) For large angular magnifications, the objective lens should have a long focal length and the eyepiece should have a relatively short focal length.

e) Light entering the telescope from a distant object comes in as nearly parallel rays.

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Fundamentals of Physics

Classroom Response System Questions

Chapter 34 Images

Interactive Lecture Questions

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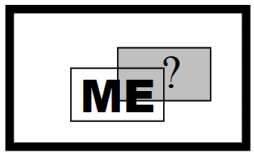
34.3.1. The word "ME" is printed in bold letters on a transparent plastic sheet. It is then held up in front of a plane mirror as shown. How will the word appear in the mirror when you look at its image?

a) ME

b) ME

c) ME

d) ME



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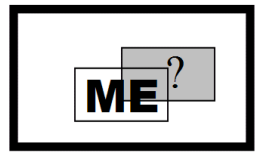

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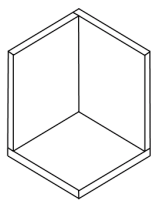
34.3.2. Three plane mirrors are arranged such that they are mutually perpendicular to one another. Imagine these apparatus is directly in front of you and you are looking into it as you stick out your tongue to the right side of your mouth. Which one of the following statements most closely describes what you would see?

a) I would see nine images of myself with my tongue sticking out of the right side of my mouth in each image.

b) I would see nine images of myself with my tongue sticking out of the left side of my mouth in each image.

c) I would see a huge number of images of myself with my tongue sticking out of the right side of my mouth in each image.

d) I would see one image of myself with my tongue sticking out of the left side of my mouth in each image.



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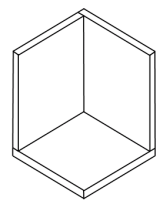

e) I would see one image of myself with my tongue sticking out of the right side of my mouth in each image.

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34.3.3. Three plane mirrors are arranged such that they form an equilateral triangle. Imagine this apparatus is directly in front of you; and you are looking into a corner as you stick out your tongue to the right side of your mouth. Which one of the following statements most closely describes what you would see?

a) I would see four images of myself with my tongue sticking out of the right side of my mouth in each image.

b) I would see four images of myself with my tongue sticking out of the left side of my mouth in each image.

c) I would see a huge number of images of myself with my tongue sticking out of the left side of my mouth in each image.

d) I would see one image of myself with my tongue sticking out of the left side of my mouth in each image.

e) I would see one image of myself with my tongue sticking out of the right side of my mouth in each image.

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c) I would see a huge number of images of myself with my tongue sticking out of the left side of my mouth in each image.

d) I would see one image of myself with my tongue sticking out of the left side of my mouth in each image.

e) I would see one image of myself with my tongue sticking out of the right side of my mouth in each image.

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34.3.4. You are standing in front of a mirror at the point P shown. There is a light bulb behind a screen that you cannot see directly. As you look in the mirror, where does the image of the light bulb appear?

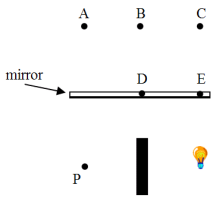
a) A

b) B

c) C

d) D

e) E



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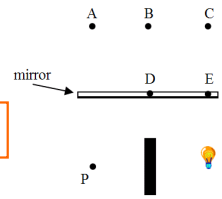

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34.3.5. Daniel walks directly toward a plane mirror at a speed of 0.25 m/s. Determine the speed of the image *relative to him*.

a) 0.13 m/s

b) 0.25 m/s

c) 0.50 m/s

d) 0.75 m/s

e) 1.0 m/s

WILEY

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e) 1.0 m/s

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34.3.6. A ball is held 1.5 m in front of a plane mirror. How far is the image of the ball from the ball?

a) 0 m

b) 0.75 m

c) 1.5 m

d) 3.0 m

e) 6.0 m

WILEY

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a) 0 m

b) 0.75 m

c) 1.5 m

d) 3.0 m

e) 6.0 m

WILEY

34.4.1. Which one of the following statements concerning a convex mirror is true?

a) Such mirrors are always a portion of a large sphere.

b) The image formed by the mirror is sometimes a real image.

c) The image will be larger than one produced by a plane mirror in its place.

d) The image will be closer to the mirror than one produced by a plane mirror in its place.

e) The image will always be inverted relative to the object.

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34.4.2. Imagine you are sitting in the back row of the classroom. Your instructor is standing in the front of the room with a large convex spherical mirror. What do you see in the mirror as your instructor walks from the front of the room to your location; all the while the mirror is facing you?

a) I see my image right side up. It gets larger as the mirror approaches.

b) I see my image right side up. It gets smaller as the mirror approaches.

c) I see my image initially inverted and then right side up. It gets larger as the mirror approaches.

d) I see my image initially inverted and then right side up. It gets smaller as the mirror approaches.

e) I see my image initially right side up and then inverted. It gets larger as the mirror approaches.

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a) I see my image right side up. It gets larger as the mirror approaches.

b) I see my image right side up. It gets smaller as the mirror approaches.

c) I see my image initially inverted and then right side up. It gets larger as the mirror approaches.

d) I see my image initially inverted and then right side up. It gets smaller as the mirror approaches.

e) I see my image initially right side up and then inverted. It gets larger as the mirror approaches.

WILEY

34.4.3. Imagine you are sitting in the back row of the classroom. Your instructor is standing in the front of the room with a large concave spherical mirror. What do you see in the mirror as your instructor walks from the front of the room to your location; all the while the mirror is facing you?

a) I see my image right side up. It gets larger as the mirror approaches.

b) I see my image right side up. It gets smaller as the mirror approaches.

c) I see my image initially inverted and then right side up. It gets larger as the mirror approaches.

d) I see my image initially inverted and then right side up. It gets smaller as the mirror approaches.

e) I see my image initially right side up and then inverted. It gets larger as the mirror approaches.

WILEY

34.4.4. Which of the following best describes the type of image formed when an object is placed between a concave mirror and its focal point?

a) real

b) virtual

c) No image is formed in this case.

WILEY

34.4.4. Which of the following best describes the type of image formed when an object is placed between a concave mirror and its focal point?

a) real

b) virtual

c) No image is formed in this case.

WILEY

34.4.5. Which of the following best describes the type of image formed when an object is placed at a distance greater than the focal point of a concave mirror?

a) real

b) virtual

c) No image is formed in this case.

WILEY

34.4.5. Which of the following best describes the type of image formed when an object is placed at a distance greater than the focal point of a concave mirror?

a) real

b) virtual

c) No image is formed in this case.

WILEY

34.4.6. Which of the following best describes the type of image formed when an object is placed between a convex mirror and its focal point?

a) real

b) virtual

c) No image is formed in this case.

WILEY

34.4.6. Which of the following best describes the type of image formed when an object is placed between a convex mirror and its focal point?

a) real

b) virtual

c) No image is formed in this case.

WILEY

34.5.1. An object is placed at the center of curvature of a concave spherical mirror. Which of the following descriptions best describes the image produced in this situation?

a) upright, larger, real

b) inverted, same size, real

c) upright, larger, virtual

d) inverted, smaller, real

e) inverted, larger, virtual

WILEY

34.5.1. An object is placed at the center of curvature of a concave spherical mirror. Which of the following descriptions best describes the image produced in this situation?

a) upright, larger, real

b) inverted, same size, real

c) upright, larger, virtual

d) inverted, smaller, real

e) inverted, larger, virtual

WILEY

34.5.2. An object is placed to the right of a spherical mirror that is concave towards the object. The object is at the focal point of the mirror. Which one of the following is the best description of the image?

a) The image is to the left of the mirror and it is larger than the object.

b) The image is to the left of the mirror and it is smaller than the object.

c) The image is to the right of the mirror and it is larger than the object.

d) The image is to the right of the mirror and it is smaller than the object.

e) No image is formed in this situation.

WILEY

34.5.2. An object is placed to the right of a spherical mirror that is concave towards the object. The object is at the focal point of the mirror. Which one of the following is the best description of the image?

a) The image is to the left of the mirror and it is larger than the object.

b) The image is to the left of the mirror and it is smaller than the object.

c) The image is to the right of the mirror and it is larger than the object.

d) The image is to the right of the mirror and it is smaller than the object.

e) No image is formed in this situation.

WILEY

34.5.3. An object is placed to the right of a spherical mirror that is concave towards the object. The focal length of the mirror is 12 cm. If the object is located 8 cm from the mirror, what is the image distance?

a) –8 cm

b) +12 cm

c) –12 cm

d) –24 cm

e) +24 cm

WILEY

34.5.3. An object is placed to the right of a spherical mirror that is concave towards the object. The focal length of the mirror is 12 cm. If the object is located 8 cm from the mirror, what is the image distance?

a) –8 cm

b) +12 cm

c) –12 cm

d) –24 cm

e) +24 cm

WILEY

34.5.4. While shopping in a grocery store you look up at a convex security mirror. You notice that your image is about one-fourth of your height. By estimating your distance to be 2.0 meters in front of the mirror, determine the focal length of the mirror.

a) 0.67 m

b) 1.3 m

c) 2.0 m

d) 4.0 m

e) 6.0 m

WILEY

34.5.4. While shopping in a grocery store you look up at a convex security mirror. You notice that your image is about one-fourth of your height. By estimating your distance to be 2.0 meters in front of the mirror, determine the focal length of the mirror.

a) 0.67 m

b) 1.3 m

c) 2.0 m

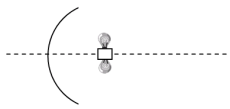
d) 4.0 m

e) 6.0 m

WILEY

34.5.5. Consider the strange device placed at the center of curvature of a concave spherical mirror shown in the drawing. The focal length of the mirror is 5.0 cm. The device has two light bulbs, but the lower one happens to be burned out. What will happen when the upper light bulb is turned on?

a) The lit bulb's image will appear inverted at the same distance behind the mirror, but the image of the unlit bulb will not be seen.



b) The lit bulb's image will appear inverted at the same distance behind the mirror and the image of the unlit bulb will be seen as the upper bulb.

c) The lit bulb's image will appear inverted at the same location as the unlit bulb, so the unlit bulb will look like its turned on.

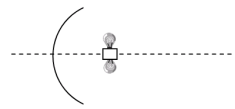
d) The lit bulb's image will appear inverted at the focal point and the image of the unlit bulb will be seen as the upper bulb.

e) The lit bulb's image will appear inverted at the at the focal point and the image of the unlit bulb will not be seen.

WILEY

34.5.5. Consider the strange device placed at the center of curvature of a concave spherical mirror shown in the drawing. The focal length of the mirror is 5.0 cm. The device has two light bulbs, but the lower one happens to be burned out. What will happen when the upper light bulb is turned on?

a) The lit bulb's image will appear inverted at the same distance behind the mirror, but the image of the unlit bulb will not be seen.



b) The lit bulb's image will appear inverted at the same distance behind the mirror and the image of the unlit bulb will be seen as the upper bulb.

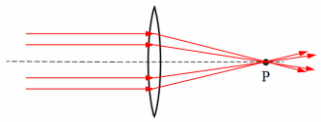
c) The lit bulb's image will appear inverted at the same location as the unlit bulb, so the unlit bulb will look like its turned on.

d) The lit bulb's image will appear inverted at the focal point and the image of the unlit bulb will be seen as the upper bulb.

e) The lit bulb's image will appear inverted at the at the focal point and the image of the unlit bulb will not be seen.

WILEY

34.6.1. Parallel rays of red light that are directed at a converging lens are focused at a point P on the central axis to the right of the lens when the lens is surrounded by air as shown. If the lens is surrounded by water instead of air, where will the red parallel rays be focused relative to point P?



a) above point P

b) below point P

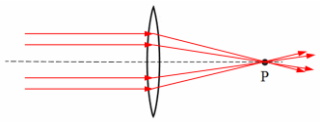
c) to the left of point P

d) to the right of point P

e) at point P

WILEY

34.6.1. Parallel rays of red light that are directed at a converging lens are focused at a point P on the central axis to the right of the lens when the lens is surrounded by air as shown. If the lens is surrounded by water instead of air, where will the red parallel rays be focused relative to point P?



a) above point P

b) below point P

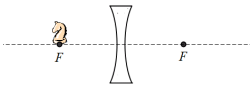
c) to the left of point P

d) to the right of point P

e) at point P

WILEY

34.7.1. The knight from a chess set is placed at the focal point of a diverging lens as shown. By carefully constructing a ray diagram, determine where the image of the knight will appear?



a) no image is formed

b) the image is at a distance *f* to the left of the lens, but it is inverted

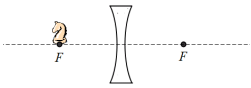
c) the image is at a distance *f* to the right of the lens, but it is upright

d) the image is at a distance *f*/2 to the right of the lens, but it is inverted

e) the image is at a distance *f*/2 to the left of the lens, but it is upright

WILEY

34.7.1. The knight from a chess set is placed at the focal point of a diverging lens as shown. By carefully constructing a ray diagram, determine where the image of the knight will appear?



a) no image is formed

b) the image is at a distance *f* to the left of the lens, but it is inverted

c) the image is at a distance *f* to the right of the lens, but it is upright

d) the image is at a distance *f*/2 to the right of the lens, but it is inverted

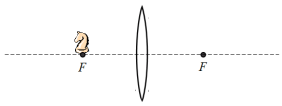
e) the image is at a distance *f*/2 to the left of the lens, but it is upright

WILEY

34.7.2. The knight from a chess set is placed at the focal point of a converging lens as shown. By carefully constructing a ray diagram, determine where the image of the knight will appear?

a) no image is formed

b) the image is at a distance greater than *f* to the left of the lens, but it is inverted



c) the image is at a distance greater than *f* to the right of the lens, but it is upright

d) the image is at a distance *f*/2 to the right of the lens, but it is inverted

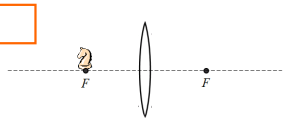
e) the image is at a distance *f*/2 to the left of the lens, but it is upright

WILEY

34.7.2. The knight from a chess set is placed at the focal point of a converging lens as shown. By carefully constructing a ray diagram, determine where the image of the knight will appear?

a) no image is formed

b) the image is at a distance greater than *f* to the left of the lens, but it is inverted



c) the image is at a distance greater than *f* to the right of the lens, but it is upright

d) the image is at a distance *f*/2 to the right of the lens, but it is inverted

e) the image is at a distance *f*/2 to the left of the lens, but it is upright

WILEY

34.7.3. An object is located 25 cm to the left of a converging lens that has a focal length of 12 cm. Consider a carefully drawn ray diagram for this situation. A real image is produced by this configuration. If you wanted to produce a larger real image without changing the relative distance of the object and lens, which of the following choices would produce the desired result?

a) Replace the lens with a diverging lens with a focal length of 4 cm.

b) Replace the lens with a converging lens with a focal length of 4 cm.

c) Replace the lens with a diverging lens with a focal length of 12 cm.

d) Replace the lens with a converging lens with a focal length of 20 cm.

e) Replace the lens with a diverging lens with a focal length of 20 cm.

WILEY

34.7.3. An object is located 25 cm to the left of a converging lens that has a focal length of 12 cm. Consider a carefully drawn ray diagram for this situation. A real image is produced by this configuration. If you wanted to produce a larger real image without changing the relative distance of the object and lens, which of the following choices would produce the desired result?

a) Replace the lens with a diverging lens with a focal length of 4 cm.

b) Replace the lens with a converging lens with a focal length of 4 cm.

c) Replace the lens with a diverging lens with a focal length of 12 cm.

d) Replace the lens with a converging lens with a focal length of 20 cm.

e) Replace the lens with a diverging lens with a focal length of 20 cm.

WILEY

34.7.4. A real object is placed to the right of a converging lens at a distance 2*f*. The focal length of the lens is *f*. By carefully drawing a ray diagram for this situation, determine which of the following statements best describes the image formed.

a) An observer on the left side of the lens would see a real image to the left of the lens that is inverted and larger than the object.

b) An observer on the left side of the lens would see a real image to the left of the lens that is inverted and smaller than the object.

c) An observer on the right side of the lens would see a real image to the left of the lens that is upright and larger than the object.

d) An observer on the right side of the lens would see a real image to the right of the lens that is upright and smaller than the object.

e) An observer on the left side of the lens would see a virtual image to the right of the lens that is inverted and smaller than the object.

WILEY

34.7.4. A real object is placed to the right of a converging lens at a distance 2*f*. The focal length of the lens is *f*. By carefully drawing a ray diagram for this situation, determine which of the following statements best describes the image formed.

a) An observer on the left side of the lens would see a real image to the left of the lens that is inverted and larger than the object.

b) An observer on the left side of the lens would see a real image to the left of the lens that is inverted and smaller than the object.

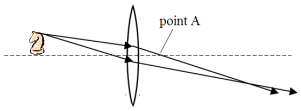
c) An observer on the right side of the lens would see a real image to the left of the lens that is upright and larger than the object.

d) An observer on the right side of the lens would see a real image to the right of the lens that is upright and smaller than the object.

e) An observer on the left side of the lens would see a virtual image to the right of the lens that is inverted and smaller than the object.

WILEY

34.7.5. Consider the two rays drawn from the top of an object. One of the rays crosses the principle axis at point A as shown. Using the information provided, which one of the following statements best describes the location of the focal point on the right side of the converging lens.



a) The focal point is a short distance to the left of point A.

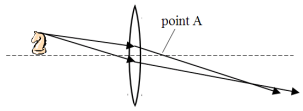
b) The focal point is a large distance to the right of point A, where the rays converge.

c) The focal point is a short distance to the right of point A.

d) The focal point is at point A.

WILEY

34.7.5. Consider the two rays drawn from the top of an object. One of the rays crosses the principle axis at point A as shown. Using the information provided, which one of the following statements best describes the location of the focal point on the right side of the converging lens.



a) The focal point is a short distance to the left of point A.

b) The focal point is a large distance to the right of point A, where the rays converge.

c) The focal point is a short distance to the right of point A.

d) The focal point is at point A.

WILEY

34.7.6. An object is placed to the left of a converging lens. The distance from the object to the lens is one and one-half times the focal length of the lens. A screen is used to view the image of the object on the right side of the lens. If the top half of the lens is covered with black electrical tape such that no light can enter the lens on that half, what would you see on the screen?

a) The top half of the image is no longer seen.

b) The bottom half of the image is no longer seen.

c) The upper most portion and lower most portion of the image are no longer seen.

d) The entire image is seen just as before.

e) The entire image is seen, but about one half as bright.

WILEY

34.7.6. An object is placed to the left of a converging lens. The distance from the object to the lens is one and one-half times the focal length of the lens. A screen is used to view the image of the object on the right side of the lens. If the top half of the lens is covered with black electrical tape such that no light can enter the lens on that half, what would you see on the screen?

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b) The bottom half of the image is no longer seen.

c) The upper most portion and lower most portion of the image are no longer seen.

d) The entire image is seen just as before.

e) The entire image is seen, but about one half as bright.

WILEY

34.7.7. An object is placed at a distance $2f$ to the left of a converging lens with a focal length f. Using the thin lens equation and the magnification equation, determine the location and magnification of the image formed by this configuration.

a) The image is formed at a distance f to the right of the lens and it has a magnification of $-1/2$.

b) The image is formed at a distance $2f$ to the right of the lens and it has a magnification of $-1/2$.

c) The image is formed at a distance f to the right of the lens and it has a magnification of -1.

d) The image is formed at a distance $2f$ to the right of the lens and it has a magnification of -1.

e) The image is formed at a distance $f/2$ to the right of the lens and it has a magnification of $-1/4$.

WILEY

34.7.7. An object is placed at a distance $2f$ to the left of a converging lens with a focal length f. Using the thin lens equation and the magnification equation, determine the location and magnification of the image formed by this configuration.

a) The image is formed at a distance f to the right of the lens and it has a magnification of $-1/2$.

b) The image is formed at a distance $2f$ to the right of the lens and it has a magnification of $-1/2$.

c) The image is formed at a distance f to the right of the lens and it has a magnification of -1.

d) The image is formed at a distance $2f$ to the right of the lens and it has a magnification of -1.

e) The image is formed at a distance $f/2$ to the right of the lens and it has a magnification of $-1/4$.

WILEY

34.7.8. An object is placed at a distance 5.0 cm to the left of a converging lens with a focal length 2.5 cm. Using the thin lens equation and the magnification equation, determine the location and magnification of the image formed by this configuration.

a) The image is formed 2.5 cm to the right of the lens and it has a magnification of $-1/2$.

b) The image is formed 5.0 cm to the right of the lens and it has a magnification of $-1/2$.

c) The image is formed 2.5 cm to the right of the lens and it has a magnification of -1.

d) The image is formed 5.0 cm to the right of the lens and it has a magnification of -1.

e) The image is formed 1.25 cm to the right of the lens and it has a magnification of $-1/4$.

WILEY

34.7.8. An object is placed at a distance 5.0 cm to the left of a converging lens with a focal length 2.5 cm. Using the thin lens equation and the magnification equation, determine the location and magnification of the image formed by this configuration.

a) The image is formed 2.5 cm to the right of the lens and it has a magnification of $-1/2$.

b) The image is formed 5.0 cm to the right of the lens and it has a magnification of $-1/2$.

c) The image is formed 2.5 cm to the right of the lens and it has a magnification of -1.

d) The image is formed 5.0 cm to the right of the lens and it has a magnification of -1.

e) The image is formed 1.25 cm to the right of the lens and it has a magnification of $-1/4$.

WILEY

34.7.9. An object is placed at a distance 5.0 cm to the left of a diverging lens with a focal length 2.5 cm. Using the thin lens equation and the magnification equation, determine the location and magnification of the image formed by this configuration.

a) The image is formed 1.7 cm to the left of the lens and it has a magnification of +1/3.

b) The image is formed 0.6 cm to the left of the lens and it has a magnification of +3/25.

c) No image is formed in this configuration.

d) The image is formed 0.6 cm to the right of the lens and it has a magnification of −3/25.

e) The image is formed 1.7 cm to the right of the lens and it has a magnification of −1/3.

WILEY

34.7.9. An object is placed at a distance 5.0 cm to the left of a diverging lens with a focal length 2.5 cm. Using the thin lens equation and the magnification equation, determine the location and magnification of the image formed by this configuration.

a) The image is formed 1.7 cm to the left of the lens and it has a magnification of +1/3.

b) The image is formed 0.6 cm to the left of the lens and it has a magnification of +3/25.

c) No image is formed in this configuration.

d) The image is formed 0.6 cm to the right of the lens and it has a magnification of −3/25.

e) The image is formed 1.7 cm to the right of the lens and it has a magnification of −1/3.

WILEY

34.7.10. Which one of the following phrases best describes images formed by diverging lenses?

a) always smaller than the object

b) always larger than the object

c) always inverted

d) always virtual

e) always real

WILEY

34.7.10. Which one of the following phrases best describes images formed by diverging lenses?

a) always smaller than the object

b) always larger than the object

c) always inverted

d) always virtual

e) always real

WILEY

34.7.11. A physics student desires to create a beam of light that consists of parallel rays. Which one of the following arrangements would allow her to accomplish this task?

a) A light bulb is placed at the focal point of a convex mirror.

b) A light bulb is placed at the focal point of a diverging lens.

c) A light bulb is placed at the focal point of a converging lens.

d) A light bulb is located at twice the focal length from a concave mirror.

e) A light bulb is located at twice the focal length from a converging lens.

WILEY

34.7.11. A physics student desires to create a beam of light that consists of parallel rays. Which one of the following arrangements would allow her to accomplish this task?

a) A light bulb is placed at the focal point of a convex mirror.

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c) A light bulb is placed at the focal point of a converging lens.

d) A light bulb is located at twice the focal length from a concave mirror.

e) A light bulb is located at twice the focal length from a converging lens.

WILEY

34.8.1. The compound microscope described in the text is made from two lenses. Which one of the following statements is true concerning the operation of this microscope?

a) Both lenses form real images.

b) Both lenses form virtual images.

c) Only the lens closest to the eye forms an image.

d) The lens closest to the object forms a real image; the other lens forms a virtual image.

e) The lens closest to the object forms a virtual image; the other lens forms a real image.

WILEY

34.8.1. The compound microscope described in the text is made from two lenses. Which one of the following statements is true concerning the operation of this microscope?

a) Both lenses form real images.

b) Both lenses form virtual images.

c) Only the lens closest to the eye forms an image.

d) The lens closest to the object forms a real image; the other lens forms a virtual image.

e) The lens closest to the object forms a virtual image; the other lens forms a real image.

WILEY

34.8.2. In her biology class, Chris examines an insect wing under a compound microscope that has an objective lens with a focal length of 0.70 cm, an eyepiece with a focal length of 3.0 cm, and a lens separation distance of 16.00 cm. Chris has a near point distance of 22.5 cm. What is the approximate angular magnification of the microscope as Chris views the insect wing?

a) −75

b) −110

c) −140

d) −190

e) −250

WILEY

34.8.2. In her biology class, Chris examines an insect wing under a compound microscope that has an objective lens with a focal length of 0.70 cm, an eyepiece with a focal length of 3.0 cm, and a lens separation distance of 16.00 cm. Chris has a near point distance of 22.5 cm. What is the approximate angular magnification of the microscope as Chris views the insect wing?

a) −75

b) −110

c) −140

d) −190

e) −250

WILEY

34.8.3. Which one of the following statements best explains why chromatic aberration occurs in lenses, but not in mirrors?

a) The shape of the mirror prevents chromatic aberration.

b) The thickness of a lens varies from top to bottom.

c) The frequency of light changes when it passes through glass.

d) The angle of incidence varies over the surface of a lens for incident parallel rays of light.

e) Different colors of light are refracted by different amounts as the light passes through a lens.

WILEY

34.8.3. Which one of the following statements best explains why chromatic aberration occurs in lenses, but not in mirrors?

a) The shape of the mirror prevents chromatic aberration.

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