

# Physics II

## Chapter 23 Reflection

### Spring 2022

IMPORTANT: Except for multiple-choice questions, you will receive no credit if you show only an answer, even if the answer is correct. Always show in the space on your answer sheet some sketches, words, or equations which clearly justify your answer. Show the equations you use and the values substituted into them whenever equations are necessary. If you go from a formula directly to an answer without showing the values used, you will lose points. Points will also be deducted for missing or erroneous units.

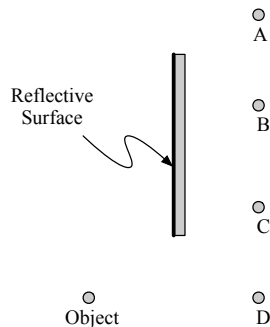
Each individual answer is weighted roughly evenly throughout the exam.

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o} \quad n_1 \sin \theta_1 = n_2 \sin \theta_2 \quad \frac{h_i}{h_o} = \frac{d_i}{d_o}$$

**Name** \_\_\_\_\_

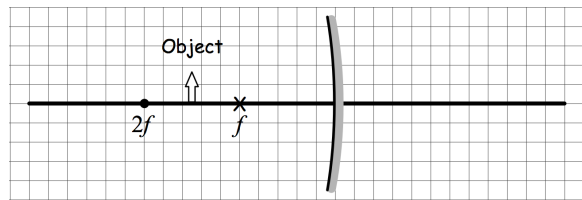
A photon checks into a hotel and is asked if he needs any help with his luggage. He says, "No, I'm traveling light."

- The image of an object in a plane mirror
  - is always smaller than the object.
  - is always the same size as the object.
  - is always larger than the object.
  - can be larger, smaller, or the same size as the object depending on its distance from the mirror.
- A magnifying mirror such as you might purchase at Bed, Bath, and Beyond is
  - convex.
  - concave.
  - flat.
  - confused.
- If you want to use a spotlight having a large parabolic mirror to advertise the grand opening of your new business, you would put a small, intense source of light such as an electric arc
  - closer to the parabolic mirror than its focus.
  - at the focus of the parabolic mirror.
  - farther from the parabolic mirror than its focus.
- When a ray of light reflects from a mirror, whether the mirror is flat, convex, concave or any other shape, the angle of incidence
  - must equal the angle of reflection.
  - is always greater than the angle of reflection.
  - may be greater than, less than, or equal to the angle of reflection.
  - is always less than the angle of reflection.



- A concave mirror with a radius of curvature of 1.0 m is used to collect light from a distant star. The distance between the mirror and the image of the star is most nearly
  - 0.25m
  - 0.50m
  - 0.75m
  - 1.0m

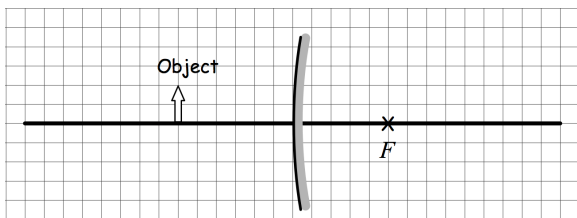
- An object is placed 0.30 meter from a mirror of focal length  $-0.15$  meter. The image is
  - inverted, real, and 0.30 meter from the lens on the opposite side from the object.
  - upright, virtual, and 0.30 meter from the lens on the opposite side from the object.
  - upright, real, and 0.10 meter from the lens on the same side as the object.
  - upright, virtual, and 0.10 meter from the lens on the same side as the object.
  - inverted, real, and 0.10 meter from the lens on the same side as the object.
- If the object distance for a converging mirror is more than twice the focal length of the mirror, the image is
  - virtual and erect.
  - larger than the object.
  - located inside the focal point.
  - located at a distance more than  $2f$  from the lens.
  - located at a distance less than  $2f$  from the lens.



- An object is placed at a distance of  $1.5f$  from a concave mirror of focal length  $f$ , as shown above. What type of image will be formed and what is its size relative to the object?
 

	Type	Size
(a)	Virtual	Larger
(b)	Virtual	Same Size
(c)	Virtual	Smaller
(d)	Real	Larger
(e)	Real	Smaller

For the next two items



9. An object is located to the left of a convex mirror having focal point  $F$ , as shown in the diagram above. The image formed by the mirror is

- (a) real, inverted, and smaller than the object.
- (b) real, inverted, and larger than the object.
- (c) real, upright, and larger than the object.
- (d) virtual, upright, and larger than the object.
- (e) virtual, upright, and smaller than the object.

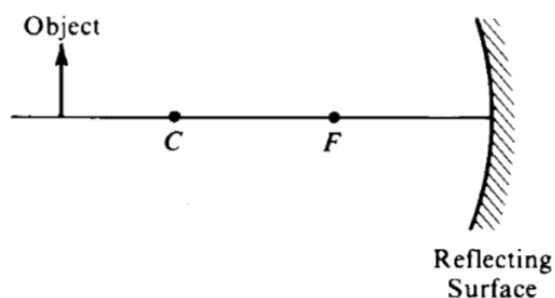
10. The image of the object would be visible to an observer in which position or positions listed below?

- I. to the left of the mirror, looking to the right
- II. to the right of the mirror, looking to the left
- III. to the left of the mirror, looking to the left

- (a) I only
- (b) II only
- (c) III only
- (d) I and II only
- (e) I, II, and III

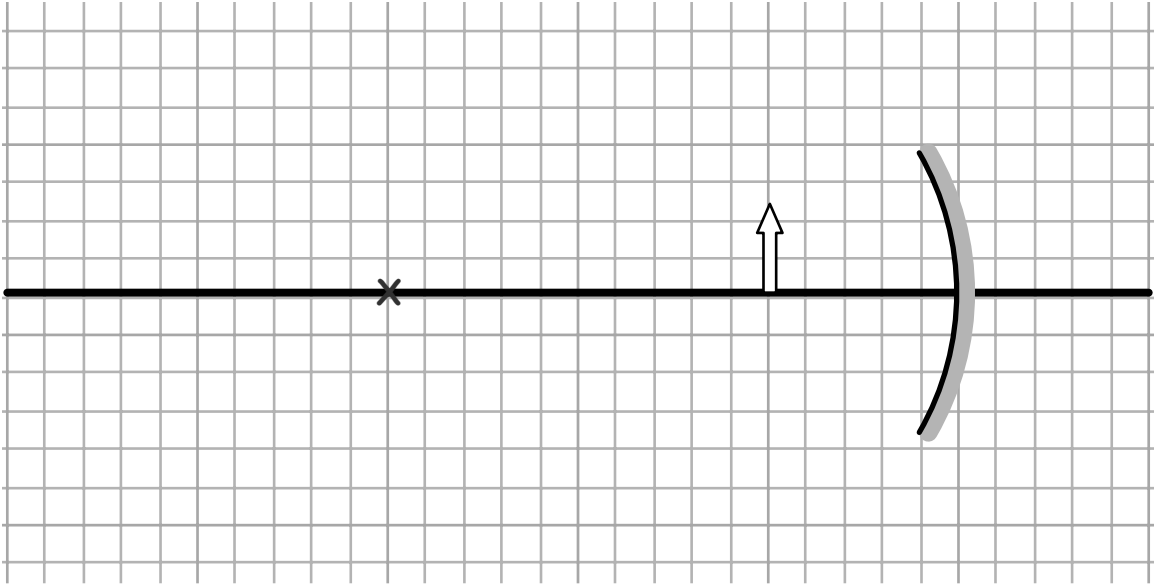
11. An object is placed 12 cm in front of a concave mirror. The mirror forms a real image of the object. This image is the same size as the object and is 12 cm in front of the mirror, too. The focal length of the mirror is

- (a) 3.0 cm
- (b) 4.0 cm
- (c) 6.0 cm
- (d) 12 cm
- (e) 24 cm



12. An object is placed as shown in the figure above. The center of curvature  $C$  and the focal point  $F$  of the reflecting surface are marked. As compared with the object, the image formed by the reflecting surface is

- (a) erect and larger
- (b) erect and the same size
- (c) erect and smaller
- (d) inverted and larger

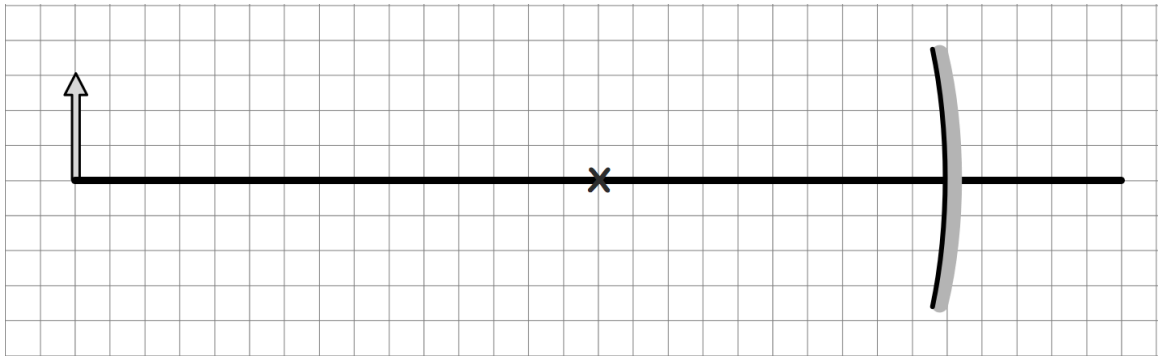


13. An object is placed 5 cm from a concave mirror that has a focal length of 15 cm as shown above.

- (a) Use a straight edge to sketch a ray diagram to locate the image that the mirror forms and sketch the entire image.
- (b) Calculate the location of the image.

\_\_\_\_\_

- (c) Is the image a **real image** or a **virtual image**? **Circle one.**
- (d) Is the image **upright** or **inverted**? **Circle one.**
- (e) Sketch on the diagram an “eye” at a location at which an observer could view the image.

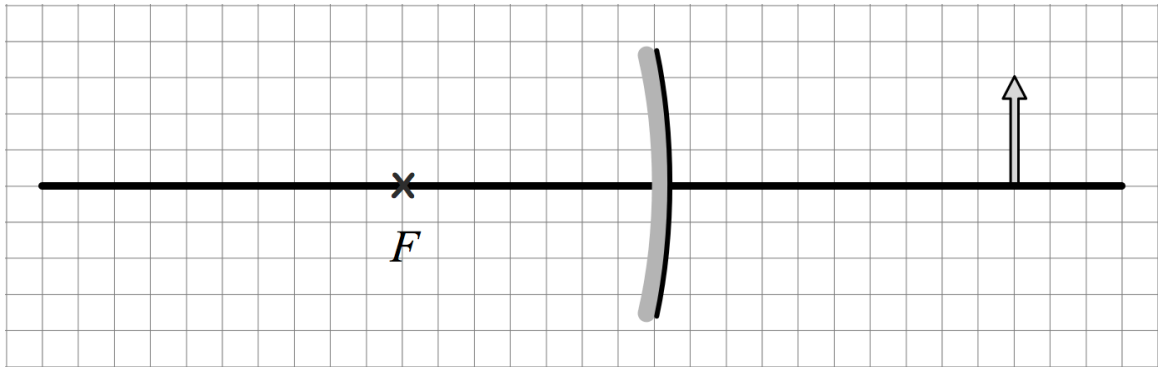


14. An object is placed 50 cm from a concave mirror that has a focal length of 20 cm as shown above.

- (a) Use a straight edge to draw a ray diagram to locate the image that the mirror forms.
- (b) Calculate the location of the image.

\_\_\_\_\_

- (c) Is the image a **real image** or a **virtual image**? **Circle one.**
- (d) Is the image **upright** or **inverted**? **Circle one.**
- (e) Sketch on the diagram an “eye” at a location at which an observer could view the image.



15. The figure above shows a convex mirror, its focus  $F$ , and an object represented by the arrow. The object is 6 cm tall.

- (a) On the figure above draw a ray diagram showing at least two rays from the tip of the object in order to locate the image of the object formed by the mirror. Sketch the entire image of the arrow.
- (b) Is this image **real** or **virtual**? Circle one.
- (c) The focal length of this mirror is  $-14$  cm and the object is 20 cm from the mirror. Calculate the position of the image.

\_\_\_\_\_

- (d) Calculate the height of the image.

\_\_\_\_\_