

Quiz Average 8.4

Quiz High Score 10

PH 202

Quiz # 08 (10 pts)

Name _____ Solution _____

A child stands 17.50 m away from a flat mirror. Which of the following best describes what the child sees when she is looking at the mirror?

- A. An Upright image located 17.50 m behind the mirror.
- B. An Inverted image located 17.50 m behind the mirror.
- C. An Upright image located 8.50 m behind the mirror.
- D. An Inverted image located 8.50 m behind the mirror.

The image forms behind the mirror since the law of reflection holds. The image is virtual since the light rays do not really come to a focus behind the mirror but only appear to form there. If you were behind the mirror, you would not see the image. So, it is virtual. Therefore, it is Upright! Plane mirrors produce images the same size as the object was in relation to the mirror. Therefore, the image is as far behind the mirror as the object is in front of the mirror.

So, the correct answer is A !

An object is 2.75 m tall and is located 27.0 m to the left of a concave mirror with a focal length of 23.0 m. The image is found to be 155.3 m to the left of the concave mirror. How tall is the image and is it Upright or Inverted?

- A. 0.478 m, Inverted!
- B. 0.478 m, Upright!
- C. 15.8 m, Upright!
- D. **15.8 m, Inverted!**

$$M = \frac{h_i}{h_o} = \frac{-i}{o}$$

Solve for image height

$$h_i = h_o \left(\frac{-i}{o} \right) = (2.75 \text{ m}) \left(\frac{-(155.3 \text{ m})}{27.0 \text{ m}} \right) = 2.75 \text{ m}(-5.75) = -15.8 \text{ m}$$

Since the height is negative, it is Inverted.

So, the correct answer is D !

Light rays travel from an object which is very far away from a convex mirror, which has a radius of curvature $R = 48.0 \text{ cm}$. After the rays strike the mirror, an image is formed which can best be described as:

- A. The image is formed at 24.0 cm behind the mirror and is upright.
- B. The image is formed at 24.0 cm in front of the mirror and is inverted.
- C. The image is formed at 96.0 cm in front of the mirror and is inverted.
- D. The image is formed at 96.0 cm behind the mirror and is upright.

The image being very far away means its object distance is infinity (∞). Thus, the image will form at the focal length of the mirror which is one half the radius of curvature or

$$f = \frac{1}{2}R = \frac{1}{2}(96.0 \text{ cm}) = 48.0 \text{ cm}$$

Convex mirrors by themselves form virtual images, which would form behind the mirror, if the object is farther away than the focal length. A single virtual image is upright.

So, the correct answer is A !

An object is located 46.3 cm to the left of a spherical mirror. The image is formed 11.2 cm to the right of the mirror. What is the focal length of the mirror and is it a Concave or a Convex mirror?

- A. 14.8 cm, Concave Mirror
- B. 14.8 cm, Convex Mirror
- C. 9.02 cm, Concave Mirror
- D. 9.02 cm, Convex Mirror

$$\frac{1}{f} = \frac{1}{o} + \frac{1}{i} = \frac{1}{46.3 \text{ cm}} + \frac{1}{-11.2 \text{ cm}} = 0.02160 \text{ cm}^{-1} - 0.08929 \text{ cm}^{-1} = -0.06769 \text{ cm}^{-1}$$

$$f = \frac{1}{-0.06769 \text{ cm}^{-1}} = -14.77 \text{ cm}$$

- sign implies Convex Mirror!

So, the correct answer is B!

An object 6.50 cm tall sits on the left side of a concave spherical mirror whose radius of curvature is 42.2 cm. The image is formed 58.5 cm to the left of the mirror. How far away was the object?

- A. 15.5 cm B. 9.39 cm C. **33.0 cm** D. 7.31 cm

One form of Mirror Equation is

$$\frac{2}{R} = \frac{1}{o} + \frac{1}{i}$$

Since the image is in front of the mirror it is real and therefore the image distance is positive.

$$\frac{1}{o} = \frac{2}{R} - \frac{1}{i} = \frac{2}{42.2 \text{ cm}} - \frac{1}{58.5 \text{ cm}} = 0.04739 \text{ cm}^{-1} - 0.01709 \text{ cm}^{-1}$$

$$\frac{1}{o} = 0.04739 \text{ cm}^{-1} - 0.01709 \text{ cm}^{-1} = +0.03030 \text{ cm}^{-1}$$

$$o = \frac{1}{+0.03030 \text{ cm}^{-1}} = 33.00 \text{ cm}$$

So, the correct answer is C !

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