Ch 32 Light: Reflection and Refraction

Working with Spherical Mirrors

Note: There are 2 central ideas in Ch 32: **spherical mirrors** and **refraction**

Objective:

I. Use the **mirror equation** to solve problems involving **spherical mirrors**

- ☐ By following the **sign convention** behind variables f, d_i, d_o, and m

Content Review: [5mins]

- The **mirror equation** is given by

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f}$$

where

$d_o =$ distance from object to mirror $\quad d_i =$ distance from image to mirror $\quad f =$ focal length of mirror

- For **spherical mirrors**, the focal length can be given by

$$f = \frac{1}{2}R, \quad \text{where } R \text{ is the radius of the mirror}$$

- The **sign convention** for using the mirror equation is . . .
  - ☐ d_o is ALWAYS **positive**
  - ☐ d_i is **positive** when the image is _____
  - ☐ h_o is ALWAYS **positive**
  - ☐ h_i is **positive** when the image is _____
  - ☐ m is **positive** when _____

Guided Practice (leader - student) [10mins]

A $4.5\,\text{cm}$ tall object is placed $26\,\text{cm}$ in front of a spherical mirror. It is described to produce a virtual image that is upright and $3.5\,\text{cm}$ tall.

(a) what type of spherical mirror should be used? (convex / concave)

(b) where is the image located?

NOTE: The math can tell us whether the mirror is convex / concave as well as whether the image is virtual / real; we just have to make sure to follow the sign convention

Solution

(a) Convex mirror

(b) $d_i = 20\,\text{cm}$

Group Activity (student - student) [25mins]

A dentist uses a curved mirror to view the back side of teeth in the upper jaw. Suppose she wants an upright image with a magnification of $1.5x$ when the mirror is $1.2\,\mathrm{cm}$ from a tooth. Should she use a convex or concave mirror? What focal length should it have?

Solution

$f = 3.6\,\mathrm{cm}$, convex mirror since $f > 0$

Group Activity (student - student) (continued)

A $2.0\,\text{cm}$ tall object is placed in front of a mirror. A $1.0\,\text{cm}$ tall upright image is formed behind the mirror, $150\,\text{cm}$ away from the object. What is the focal length of the mirror?

NOTE: The $150\,\text{cm}$ is the distance between the object and the image.

Solution

$f = -100\,\text{cm}$