1. An object and a screen are separated by 20.00 cm. A converging lens is placed between them, 5.00 cm from the object. In this position it causes a sharp image of the object to form on the screen. What is the focal length of the lens?

a. 15.0 cm  

b. 5.00 cm  

c. 3.75 cm  

d. 2.00 cm

![Diagram](image)

\[ \frac{1}{f} = \frac{1}{p} + \frac{1}{q} \]

\[ p = 5 \text{ cm} \Rightarrow q = 15 \text{ cm} \]

\[ \frac{1}{f} = \left( \frac{1}{5} + \frac{1}{15} \right) \frac{1}{\text{cm}} = \frac{4}{15} \text{ cm} \]

\[ f = \frac{15}{4} \text{ cm} = 3.75 \text{ cm} \]

2. A projector lens is needed to form an image on a screen 10 times the size of its corresponding object. The screen is located 8.0 m from the lens. What is the required focal length of the lens?

a. 0.32 m  

b. 0.54 m  

c. 0.73 m  

d. 1.25 m

![Diagram](image)

\[ M = 10 = \left| \frac{q}{p} \right| \]

\[ q = 8 \text{ m} \Rightarrow q = 8 \text{ m} \]

\[ p = \frac{q}{10} = \frac{8 \text{ m}}{10} = 0.8 \text{ m} \]

But \[ \frac{1}{f} = \frac{1}{p} + \frac{1}{q} \]

\[ \frac{1}{f} = \frac{1}{0.8 \text{ m}} + \frac{1}{8 \text{ m}} = \frac{11}{8 \text{ m}} \Rightarrow f = \frac{8 \text{ m}}{11} \]
3. An object is 12.0 cm from the surface of a spherical Christmas tree ornament that is 8.00 cm in diameter. What is the magnification of the image?

\[ \frac{1}{Q} = \frac{1}{f} - \frac{1}{P} = \frac{1}{-2 \text{ cm}} - \frac{1}{12 \text{ cm}} = \frac{-6 - 1}{12 \text{ cm}} = \frac{-7}{12 \text{ cm}} \Rightarrow Q = \frac{-12\alpha}{7} \]

\[ f = \frac{R}{2} = -2 \text{ cm} \]

\[ M = \frac{-Q}{P} = \frac{-12\alpha}{7} \cdot \frac{12}{P} \Rightarrow M = \frac{-12\alpha}{7P} \]

- a. \(-0.200\)
- b. \(-0.500\)
- c. \(+0.143\)
- d. \(+0.250\)

4. When the reflection of an object is seen in a concave mirror the image will:

- a. always be real.
- b. always be virtual.
- c. may be either real or virtual.
- d. will always be enlarged.

5. If a man wishes to use a plane mirror on a wall to view both his head and his feet as he stands in front of the mirror, the approximate required length of the mirror:

- a. is equal to the height of the man.
- b. is equal to one half the height of the man.
- c. depends on the distance the man stands from the mirror.
- d. depends on both the height of the man and the distance from the man to the mirror.