

Answer on Question #51836-Physics- Optics

2 When a virtual image is created in a plane mirror

- a) the image is upright. b) the image is located behind the mirror. c) reflected rays diverge. d) all of the above

Solution

When you look at yourself in a plane mirror and you see your image - it is upright. The image is located on the other side of the mirror since reflected rays diverge upon reflection; when mirrors produce images on the opposite side of the mirror, the images are said to be virtual.

Answer: d) all of the above.

3 The critical angle for a light from the bottom of a swimming pool shining upward toward the pool's surface is the angle?

- a) where light is refracted so it just skims the pool surface. b) 43 degrees. c) at which all light is refracted out of the pool. d) 42 degrees.

Solution

Light is traveling through water towards the boundary with a less dense material such as air. When the angle of incidence in water reaches a certain critical value, the refracted ray lies along the boundary, having an angle of refraction of 90-degrees. This angle of incidence is known as the critical angle; it is the largest angle of incidence for which refraction can still occur. In this question, when light from the bottom of a swimming pool shining upward toward the pool's surface reaches the water-air interface at the critical angle, the light is refracted so it just skims the pool surface.

Answer: a) where light is refracted so it just skims the pool surface.

4 Convex mirrors are mostly used as?

- a) magnifying glasses b) driving mirrors c) dentist mirrors d) artist mirrors

Solution

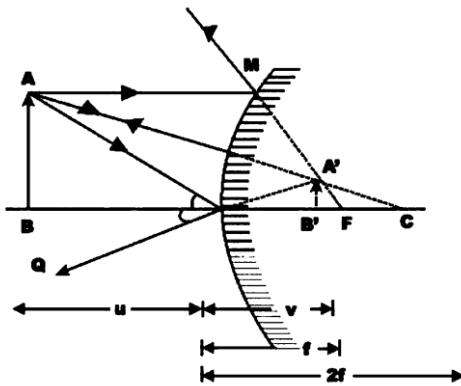
Convex mirrors are mostly used as driving mirrors due to wider field of view. It help driver to see more on the road. Also convex mirrors often used on the crosses with limited field view to help drivers.

Answer: b) driving mirrors.

5 In an experiment involving a spherical mirror, $1/v$ was plotted on the vertical axis and $1/u$ on the horizontal axis. What is the linear magnification?

- a) slope of the graph b) inverse of the slope of the graph c) intercept on the vertical axis d) intercept on the horizontal axis

Solution



Optical magnification is the ratio between the apparent size of an object (or its size in an image) and its true size, and thus it is a dimensionless number.

If v is distance from mirror to image and u is distance from object to mirror, then magnification is equal to:

$$M = \frac{v}{u} = \frac{\frac{1}{u}}{\frac{1}{v}}$$

$\frac{1}{u}$ was plotted on the horizontal axis and $\frac{1}{v}$ was plotted on vertical axis, hence linear magnification is the inverse of the slope of the graph.

$$\text{inverse slope of the graph} = \frac{1}{\frac{\text{vertical axis}}{\text{horizontal axis}}} = \frac{\text{horizontal axis}}{\text{vertical axis}} = \frac{\frac{1}{u}}{\frac{1}{v}} = M.$$

Answer: b) inverse of the slope of the graph.