

PHY 167 Recitation 3

Chapters 21, 22, and 23.

April 5, 2019

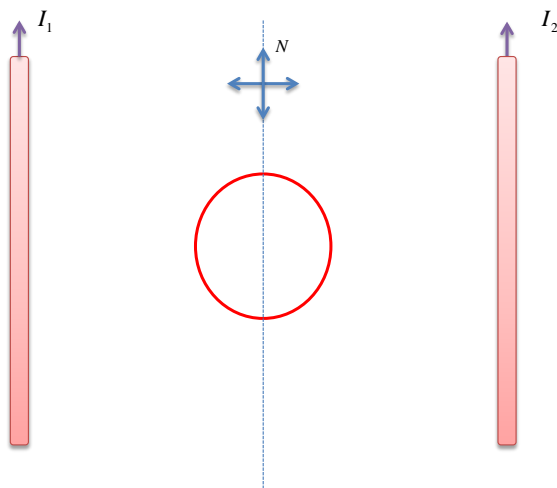


Figure 1: Picture of the setup in problem 1.

- 1.) A circular loop is placed between two long parallel wires of carrying currents I_1 and I_2 , as shown in Fig.1. For each case below, what will be the direction of the induced current, if any, on the wire loop:
- (a.) The wire loop is **at rest** directly in the center of the wires, as initially shown.
 - (b.) The wire loop is moved to the **left**, towards I_1 .
 - (c.) The wire loop is moved to the **right**, towards I_2 .
 - (d.) The wire loop is moved **upwards**, North, along the dashed line.

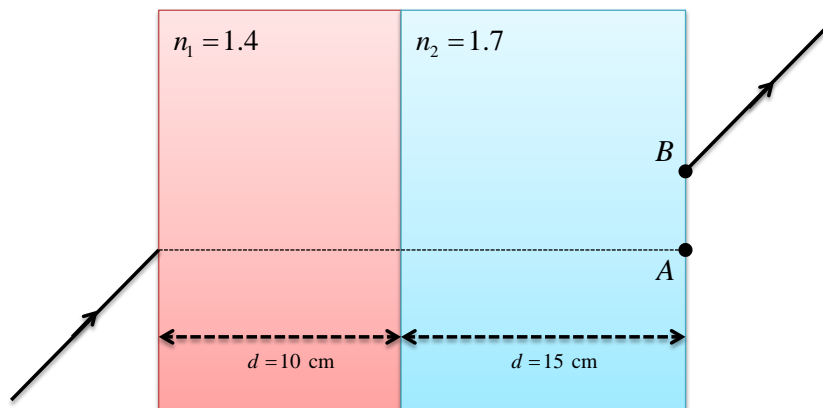


Figure 2: Picture of the setup in problem 2.

- 2.) Two parallel-sided blocks of glass of refraction index $n_1 = 1.4$ and $n_2 = 1.7$ lie next to each other as shown above. A light ray strikes the first one at an incident angle of 40° .
- (a.) Calculate the angle of refraction θ as the ray emerges from the second block to air.
 - (b.) Calculate the distance AB , where B is the point of exit.
- 3.) An object 10 mm tall is placed 12 cm in front of a convex spherical mirror whose radius of curvature is 20 cm .
- (a.) Determine the position, size and orientation of the image.
 - (b.) Draw the corresponding ray diagram.
 - (c.) Repeat parts (a.) and (b.) if the convex mirror is replaced by a concave one.
- 4.) An object is placed 30 cm in front of a lens. An upright image is created three times smaller than the object.
- (a.) Calculate the focal length of the lens. Is it converging or diverging?
 - (b.) Draw the corresponding ray diagram.
 - (c.) Repeat parts (a.) and (b.) if the image is inverted and three times smaller than the object.
- 5.) Two slits spaced 0.130 mm apart are placed 90 cm from a screen and illuminated by coherent light of wavelength 550 nm .
- (a.) What is the distance in millimeters on the screen between the center of the central maximum and the center of the third-order maximum?
 - (b.) What is the distance in millimeters on the screen between the center of the central maximum and the first dark fringe?