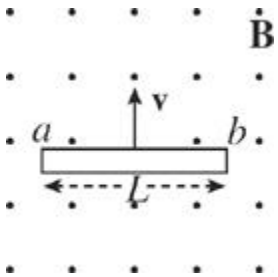
1. A metal rod of length *L* is pulled upward with constant velocity **v** through a uniform magnetic field **B** that points out of the plane of the page.



What is the potential difference between points *a* and *b* ?

A. 0

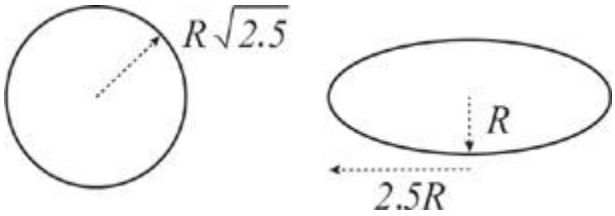
B. $\frac{1}{2}$ v*BL*, with point *a* at the higher potential

C. $\frac{1}{2}$ v*BL*, with point *b* at the higher potential

D. v*BL*, with point *a* at the higher potential

E. v*BL*, with point *b* at the higher potential

2. The circle and ellipse below have the same area.



If both loops are held so that their plane is perpendicular to a uniform magnetic field, **B**, how would Φ_C, the magnetic flux through the circular loop, compare to Φ_E, the magnetic flux through the elliptical loop?

A. $\Phi_C = 2.5\Phi_E$

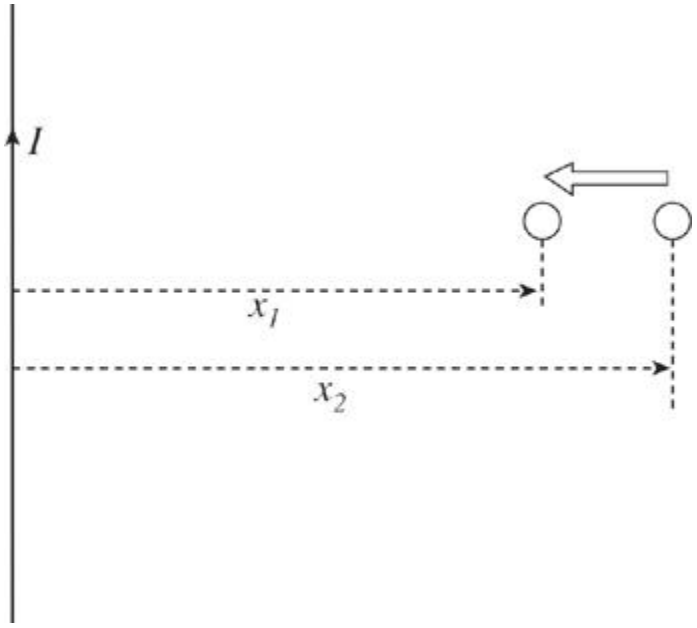
B. $\Phi_C = \sqrt{2.5}\ \Phi_E$

C. $\Phi_C = \Phi_E$

D. $\Phi_E = \sqrt{2.5}\ \Phi_C$

E. $\Phi_E = 2.5\Phi_C$

3. The figure below shows a small circular loop of wire in the plane of a long, straight wire that carries a steady current *I* upward. If the loop is moved from distance x_2 to distance x_1 from the straight wire, what will be the direction of the induced current in the loop and the direction of the corresponding magnetic field it produces?



A. The induced current will be clockwise, and the magnetic field it produces will point out of the plane of the page.

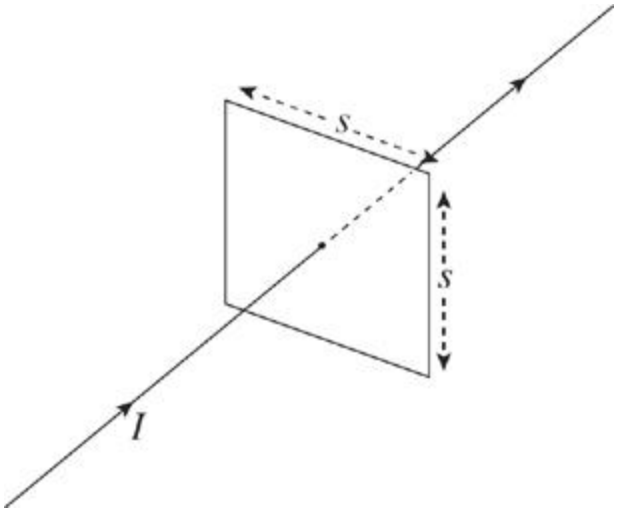
B. The induced current will be clockwise, and the magnetic field it produces will point into the plane of the page.

C. The induced current will be counterclockwise, and the magnetic field it produces will point out of the plane of the page.

D. The induced current will be counterclockwise, and the magnetic field it produces will point into the plane of the page.

E. None of the above

4. A square loop of wire (side length = *s*) surrounds a long, straight wire such that the wire passes through the center of the square.



If the current in the wire is *I*, determine the current induced in the square loop.

A. $\frac{2\mu_0 Is}{\pi\left(1+\sqrt{2}\right)}$

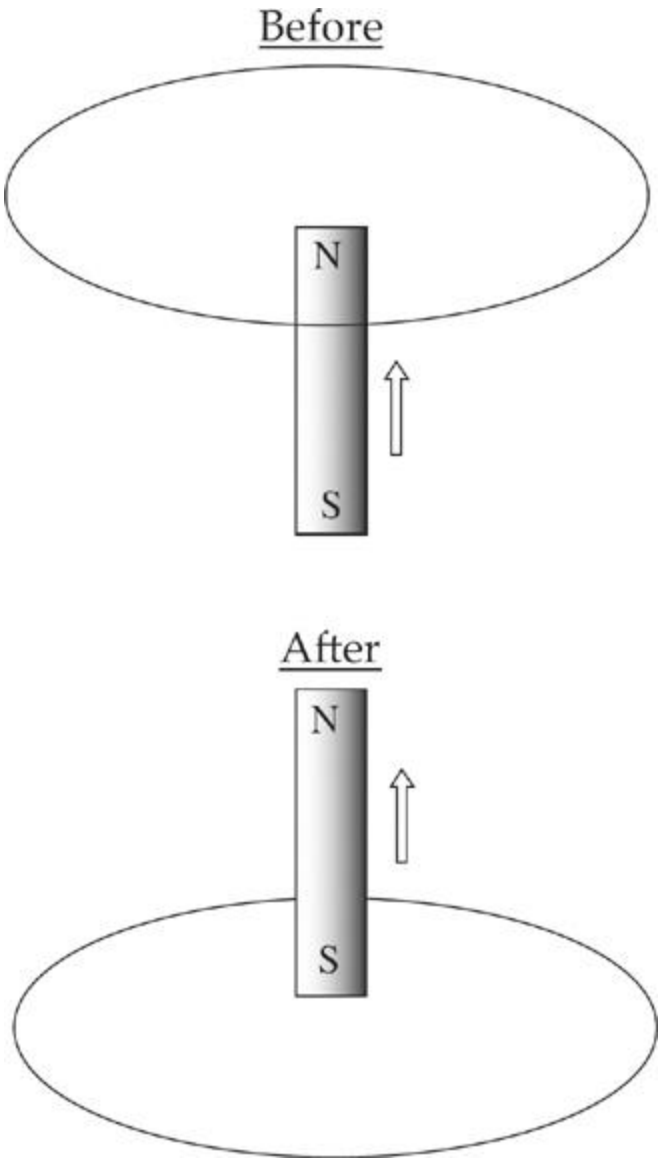
B. $\frac{\mu_0 Is}{\pi\sqrt{2}}$

C. $\frac{\mu_0 Is}{\pi}$

D. $\frac{\mu_0 Is\sqrt{2}}{\pi}$

E. 0

5. In the figure below, a permanent bar magnet is pulled upward with a constant velocity through a loop of wire.



Which of the following best describes the direction(s) of the current induced in the loop (looking down on the loop from above)?

A. Always clockwise

B. Always counterclockwise

C. First clockwise, then counterclockwise

D. First counterclockwise, then clockwise

E. No current will be induced in the loop.