

CHAPTER 22 | ELECTROMAGNETIC INDUCTION

5. **REASONING AND SOLUTION** For each of the three rods in the drawing, we have the following:

Rod A: The motional emf is **zero**, because the velocity of the rod is parallel to the direction of the magnetic field, and the charges do not experience a magnetic force.

Rod B: The motional emf is, according to Equation 22.1,

$$\text{emf} = vBL = (2.7 \text{ m/s})(0.45 \text{ T})(1.3 \text{ m}) = \mathbf{1.6 \text{ V}}$$

The positive end of Rod 2 is **end 2**.

Rod C: The motional emf is **zero**, because the magnetic force F on each charge is directed perpendicular to the length of the rod. For the ends of the rod to become charged, the magnetic force must be directed parallel to the length of the rod.

17. **REASONING** The general expression for the magnetic flux through an area A is given by Equation 22.2: $\Phi = BA \cos\phi$, where B is the magnitude of the magnetic field and ϕ is the angle of inclination of the magnetic field \mathbf{B} with respect to the normal to the area.

SOLUTION Since the magnetic field \mathbf{B} is parallel to the surface for the triangular ends and the bottom surface, the flux through each of these three surfaces is **zero**.

The flux through the 1.2 m by 0.30 m face is

$$\Phi = (0.25 \text{ T})(1.2 \text{ m})(0.30 \text{ m}) \cos 0.0^\circ = \mathbf{0.090 \text{ Wb}}$$

For the 1.2 m by 0.50 m side, the area makes an angle ϕ with the magnetic field \mathbf{B} , where

$$\phi = 90^\circ - \tan^{-1}\left(\frac{0.30 \text{ m}}{0.40 \text{ m}}\right) = 53^\circ$$

Therefore,

$$\Phi = (0.25 \text{ T})(1.2 \text{ m})(0.50 \text{ m}) \cos 53^\circ = \mathbf{0.090 \text{ Wb}}$$

25. **REASONING AND SOLUTION** According to Ohm's law, the emf developed by the coil is $\text{emf} = IR$, which, when combined with the definition of electric current becomes

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Ginsberg



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Table of Contents Chapter 22 Electromagnetic Induction

1. Understanding the eBook Chapter 22 Electromagnetic Induction
 - The Rise of Digital Reading Chapter 22 Electromagnetic Induction
 - Advantages of eBooks Over Traditional Books
2. Identifying Chapter 22 Electromagnetic Induction
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Chapter 22 Electromagnetic Induction
 - User-Friendly Interface
4. Exploring eBook Recommendations from Chapter 22 Electromagnetic Induction
 - Personalized Recommendations
 - Chapter 22 Electromagnetic Induction User Reviews and Ratings
 - Chapter 22 Electromagnetic Induction and Bestseller Lists
5. Accessing Chapter 22 Electromagnetic Induction Free and Paid eBooks
 - Chapter 22 Electromagnetic Induction Public Domain eBooks
 - Chapter 22 Electromagnetic Induction eBook Subscription Services

- Chapter 22 Electromagnetic Induction Budget-Friendly Options
- 6. Navigating Chapter 22 Electromagnetic Induction eBook Formats
 - ePub, PDF, MOBI, and More
 - Chapter 22 Electromagnetic Induction Compatibility with Devices
 - Chapter 22 Electromagnetic Induction Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Chapter 22 Electromagnetic Induction
 - Highlighting and Note-Taking Chapter 22 Electromagnetic Induction
 - Interactive Elements Chapter 22 Electromagnetic Induction
- 8. Staying Engaged with Chapter 22 Electromagnetic Induction
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Chapter 22 Electromagnetic Induction
- 9. Balancing eBooks and Physical Books Chapter 22 Electromagnetic Induction
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Chapter 22 Electromagnetic Induction
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Chapter 22 Electromagnetic Induction
 - Setting Reading Goals Chapter 22 Electromagnetic Induction
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Chapter 22 Electromagnetic Induction
 - Fact-Checking eBook Content of Chapter 22 Electromagnetic Induction
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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