Ch 29: Induwuction

Season 3 Episode 4 - itz time

In this episode of LARC Physics 3B, we're going to . . .

- Create a foundation for solving "Induction" problems by
  - ☐ Applying Faraday's Law to get the induced emf ξ
  - ☐ Applying Lenz's Law to get the direction of the induced current

Lecture Review

Big Ideas: Changing magnetic flux creates (induces) a current

Key Words: Lenz's Law, Faraday's Law, induced emf, induced current, magnetic flux.

Here are some important equations/concepts:

- Magnetic flux Φ represents the flow of magnetic field lines through some cross-sectional area

$$\Phi = \oint \vec{B} \cdot d\vec{A} \longrightarrow BA, \quad \text{the integral often simplifies into this form}$$

- Faraday's Law: the induced emf (voltage) is given by

$$\xi = -\frac{d\Phi}{dt}$$

- Lenz's Law: *fight the flux!!*

  A changing magnetic flux induces a current (within a wire) such that the magnetic field created by that current fights the change in flux.

Guided Practice

63. ‖ What is the current through the 10 Ω resistor in FIGURE P31.63? Is the current from left to right or right to left?

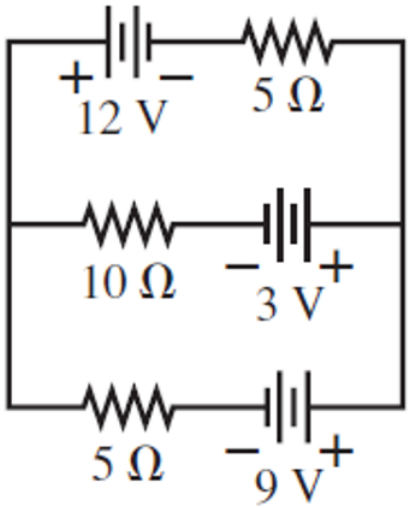


FIGURE P31.63

Keep in mind:

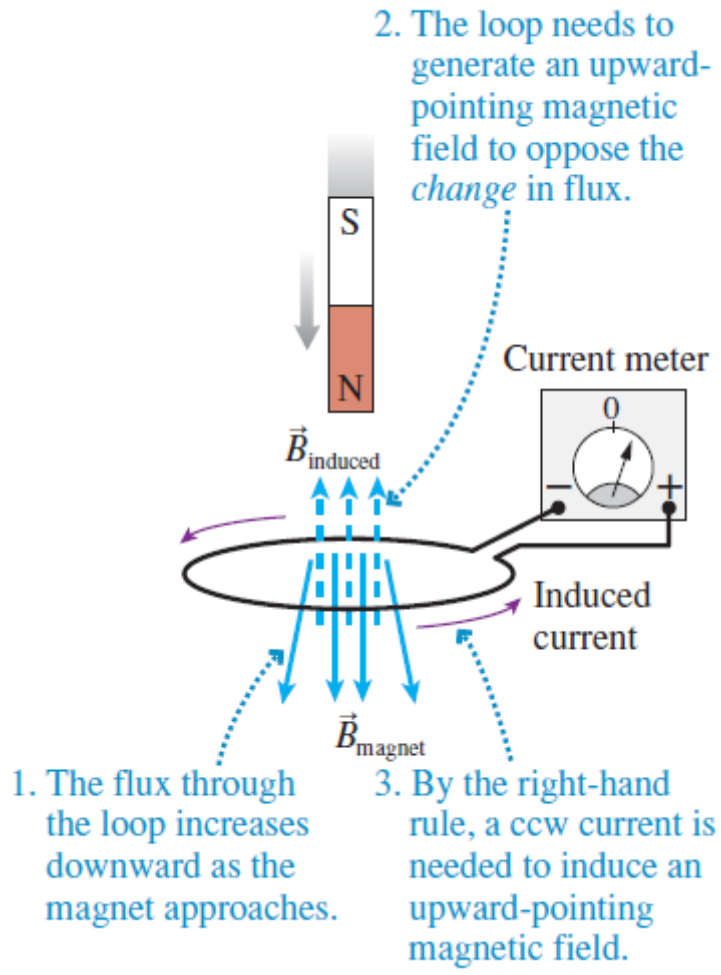
Kirchhoff's Loop Law: $\Delta V = 0$ Kirchhoff's Junction Law: $I_{\text{in}} = I_{\text{out}}$

Answer: $I = 0.12\,\text{A}$, flowing from left to right.

Guided Practice

Let's apply Lenz's Law to find the direction of the induced current.

FIGURE 33.19 The induced current is ccw.



Breakout-Room Activity

12. | The loop in FIGURE EX33.12 is being pushed into the 0.20 T magnetic field at 50 m/s. The resistance of the loop is 0.10 Ω. What are the direction and the magnitude of the current in the loop?

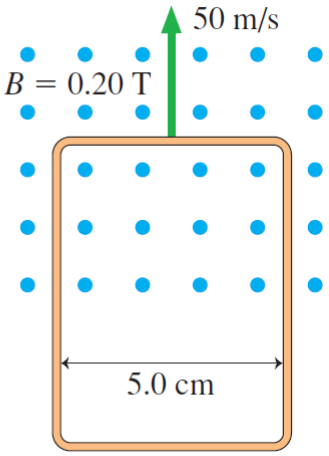


FIGURE EX33.12

Answer: $I = 5\,\text{A}$, clockwise