CENGAGE | WEBASSIGN

yathartha.regmi@ttu.edu
(Sign out)

← PHYS 2401, section 201, Summer 2 2022

Faraday's Law (Homework)

INSTRUCTOR
Keith West
Texas Tech University

Current Score

QUESTION	1	2	3	4	5	6	7	8
POINTS	–/1	–/1	–/5	–/3	–/1	–/2	–/3	–/2

TOTAL SCORE

–/18	0.0%

Due Date

THU, AUG 4, 2022
11:58 PM CDT

Request Extension

Assignment Submission & Scoring

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.

Assignment Scoring

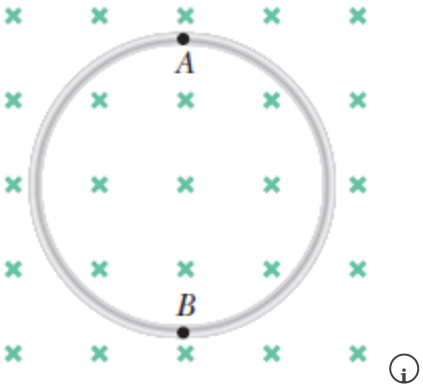
Your last submission is used for your score.

---

1. **[–/1 Points]** DETAILS **SERPSE10 30.1.OP.004.**

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

The figure below displays a circular loop of aluminum wire in a uniform magnetic field pointing into the page. The radius of the loop is 10.0 cm and the magnitude of the field is 0.160 T. You grab points *A* and *B* and pull them in opposite directions, stretching the loop until its area is nearly zero, taking a time of 0.210 s to do so. What is the magnitude of the average induced emf in the loop (in mV) during this time?



mV

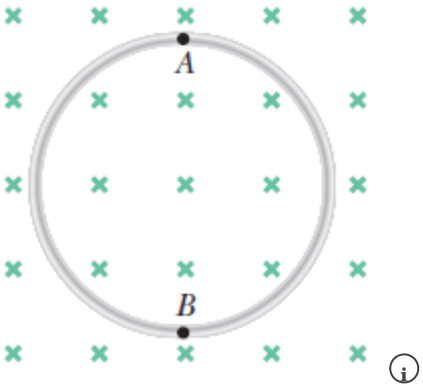
Need Help? Read It

2. [–/1 Points] DETAILS SERPSE10 30.1.P.001.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A circular loop of wire of radius 11.0 cm is placed in a magnetic field directed perpendicular to the plane of the loop as shown in the figure below. If the field decreases at the rate of 0.058 0 T/s in some time interval, find the magnitude of the emf induced in the loop during this interval.

mV

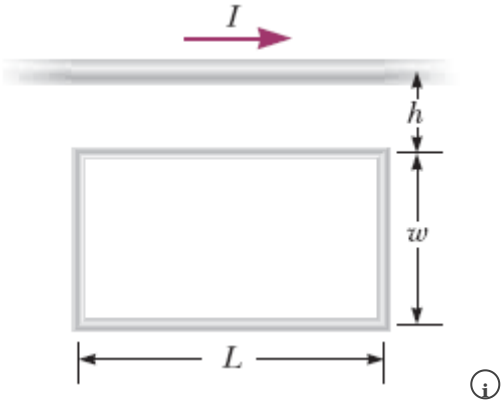


Need Help? Read It

3. [–/5 Points] DETAILS SERPSE10 30.1.OP.009.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A loop of wire in the shape of a rectangle of width w and length L and a long, straight wire carrying a current I lie on a tabletop as shown in the figure below.



(a) Determine the magnetic flux through the loop due to the current I. (Use any variable stated above along with the following as necessary: μ_0.)

Φ_B =

(b) Suppose the current is changing with time according to $I = a + bt$, where a and b are constants. Determine the magnitude of the emf (in V) that is induced in the loop if b = 18.0 A/s, h = 1.00 cm, w = 20.0 cm, and L = 1.40 m.

V

(c) What is the direction of the induced current in the rectangle?

- clockwise
- counterclockwise
- The magnitude is zero.

What If? Suppose a constant current of I = 6.00 A flows in the straight wire and the loop moves from an initial position h_0 = 1.00 cm toward the bottom of the figure at a constant speed of v = 18.0 cm/s.

(d) What is the magnitude of the induced emf (in V) in the loop 1.00 s after it begins to move?

V

(e) What is the direction of the induced current in the loop 1.00 s after it begins to move?

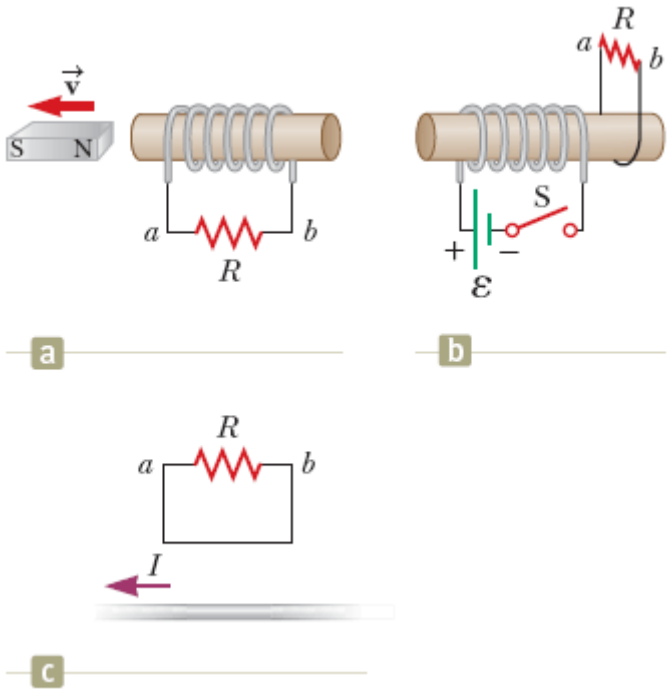
- ○ clockwise
- ○ counterclockwise
- ○ The magnitude is zero.

Need Help? Read It Watch It

4. [–/3 Points] DETAILS SERPSE10 30.3.OP.018.

MY NOTES ASK YOUR TEACHER

Use Lenz's law to answer the following questions concerning the direction of induced currents. Express your answers in terms of the letter labels *a* and *b* in each part of the figure below.



(a) What is the direction of the induced current in the resistor *R* in Figure a when the bar magnet is moved to the left?

- ○ *a* to *b*
- ○ *b* to *a*
- ○ The magnitude is zero.

(b) What is the direction of the current induced in the resistor *R* after the switch S in Figure b is closed?

- ○ *a* to *b*
- ○ *b* to *a*
- ○ The magnitude is zero.

(c) What is the direction of the induced current in the resistor *R* when the current *I* in Figure c decreases rapidly to zero?

- ○ *a* to *b*
- ○ *b* to *a*
- ○ The magnitude is zero.

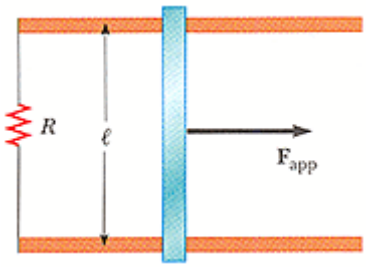
Need Help? Read It Watch It

---

5. [–/1 Points] DETAILS SERPSE10 30.2.OP.014.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

In the figure below, a steel bar sitting on two parallel metal rails, connected to each other by a resistor, is pulled to the right at a constant speed. The resistance R = 3.00 Ω, the distance between the rails is ℓ = 1.20 m, and a uniform 3.30 T magnetic field is directed into the page. At what speed (in m/s) should the bar be moved to produce a current of 0.500 A in the resistor?



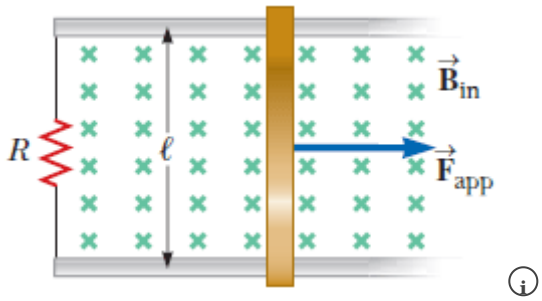
m/s

Need Help? Read It

6. [–/2 Points] DETAILS SERPSE10 30.2.OP.015.MI.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

The figure below shows a top view of a bar that can slide on two frictionless rails. The resistor is R = 6.20 Ω, and a 2.50-T magnetic field is directed perpendicularly downward, into the page. Let ℓ = 1.20 m.



(a) Calculate the applied force required to move the bar to the right at a constant speed of 2.30 m/s.

[ ] N (to the right)

(b) At what rate is energy delivered to the resistor?

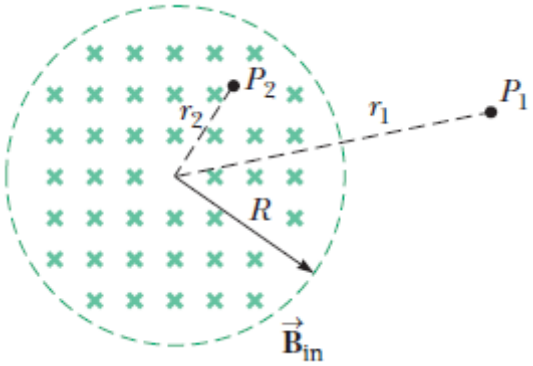
[ ] W

Need Help? Read It Master It

7. [–/3 Points] DETAILS SERPSE10 30.4.P.021.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

Within the green dashed circle shown in the figure below, the magnetic field changes with time according to the expression $B = 6.00t^3 - 1.00t^2 + 0.800$, where B is in teslas, t is in seconds, and $R = 2.75$ cm.



(a) When $t = 2.00$ s, calculate the magnitude of the force exerted on an electron located at point P_1, which is at a distance $r_1 = 5.50$ cm from the center of the circular field region.

[ ] N

(b) When $t = 2.00$ s, calculate the direction of the force exerted on an electron located at point P_1, which is at a distance $r_1 = 5.50$ cm from the center of the circular field region.

- ○ tangent to the electric field line passing through point P_1 and clockwise
- ○ tangent to the electric field line passing through point P_1 and counterclockwise
- ○ The magnitude is zero.

(c) At what instant is this force equal to zero? (Consider the time after $t = 0$ s.)

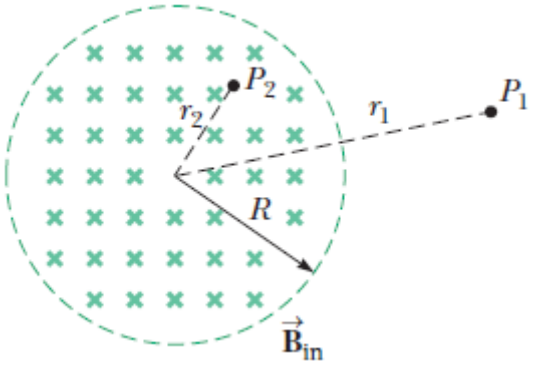
[ ] s

Need Help? Read It

8. [–/2 Points] DETAILS SERPSE10 30.4.OP.020.MI.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A magnetic field directed into the page changes with time according to $B = 0.025\ 0t^2 + 1.40$, where B is in teslas and t is in seconds. The field has a circular cross section of radius $R = 2.50$ cm (see figure below).



(a) When $t = 4.60$ s and $r_2 = 0.020\ 0$ m, what is the magnitude of the electric field at point P_2?

[ ] N/C

(b) When $t = 4.60$ s and $r_2 = 0.020\ 0$ m, what is the direction of the electric field at point P_2?

- ○ perpendicular to r_2 and counterclockwise
- ○ out of the page
- ○ into the page
- ○ perpendicular to r_2 and clockwise

Need Help? Read It Master It

Submit Assignment Save Assignment Progress

Home My Assignments Request Extension