# ANNOUNCEMENTS

- Project problems have been graded
  - Sync your repository to get your feedback; read it!
- No class Monday (DC out of town)
  - Email and text are fine if you need help with HW
  - Also use Piazza!
- Quiz 2 - Next Friday (Motional EMF)
  - Discuss the differences between:
    - $\mathcal{E} = \oint \mathbf{f} \cdot d\mathbf{l}$ and $\mathcal{E} = -\frac{d\Phi_B}{dt}$
 - Solve a motional EMF problem and discuss the direction of the current

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A rectangular metal loop moves through a region of constant uniform magnetic field $\mathbf{B}$, with speed v at $t = 0$, as shown. What is the magnetic force on the loop at the instant shown? Assume the loop has resistance R.
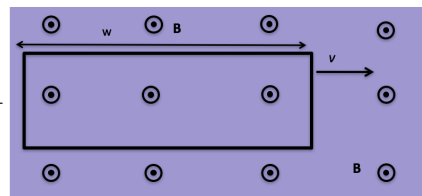
A. $2L^2vB^2/R$ (right)
B. $2L^2vB^2/R$ (left)
C. 0
D. Something else/not sure…

Consider two situations:

1) Loop moves to right with speed $|v|$

2) Magnet moves to left with (same) speed $|v|$
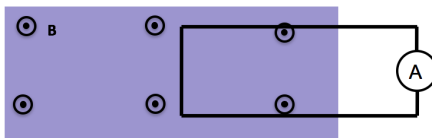
What will the ammeter read in each case? (Assume that CCW current => positive ammeter reading)

A. $I_1 > 0$, $I_2 = 0$
B. $I_1 = I_2 > 0$
C. $I_1 = -I_2 > 0$
D. $I_1 = I_2 = 0$
E. Something different/not sure

Faraday found that EMF is proportional to the negative time rate of change of B. EMF is also the line integral of a **force/charge**. The force is $\mathbf{f}_q$ in the expression:

$$\mathcal{E} = \oint \mathbf{f}_q \cdot d\mathbf{l}$$

That force is:

A. the magnetic Lorentz force.
B. an electric force.
C. the strong nuclear force.
D. the gravitational force.
E. an entirely new force.

A stationary rectangular metal loop is in a region of uniform magnetic field $\mathbf{B}$, which has magnitude B decreasing with time as $B = B_0 - kt$. What is the direction of the field induced B-field created by the induced current in the loop, in the plane region inside the loop?

A. Into the screen
B. Out of the screen
C. To the left
D. To the right
E. other/??
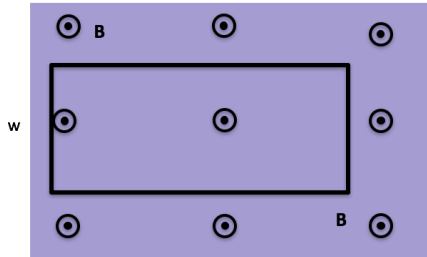
A rectangular metal loop is moving thru a region of constant uniform magnetic field $\mathbf{B}$, out of page, with constant speed v, as shown. Is there a non-zero emf around the loop?

A. Yes, current will flow CW
B. Yes, current will flow CCW
C. No
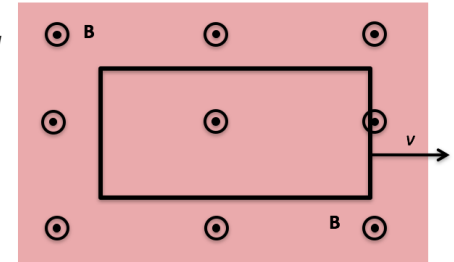
A loop of wire is near a long straight wire which is carrying a large current I, which is **decreasing**. The loop and the straight wire are in the same plane and are positioned as shown. The current induced in the loop is:
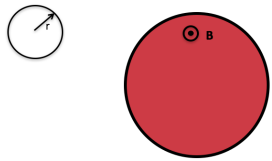
A. counter-clockwise
B. clockwise
C. zero.
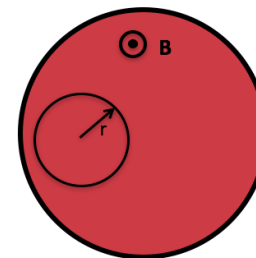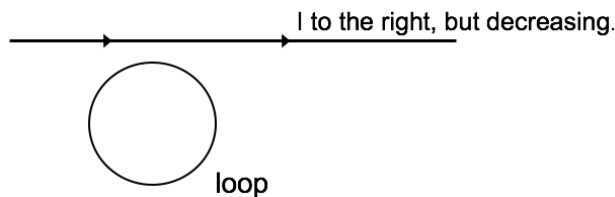
I to the right, but decreasing.

loop

The current in an infinite solenoid with uniform magnetic field $\mathbf{B}$ inside is increasing so that the magnitude B in increasing with time as $B = B_0 + kt$. A small circular loop of radius r is placed NON-coaxially inside the solenoid as shown.

What is the emf around the small loop? (Assume CW is the direction of dl in the EMF loop integration)

A. $k\pi r^2$
B. $-k\pi r^2$
C. Zero
D. Nonzero, but need more information for value
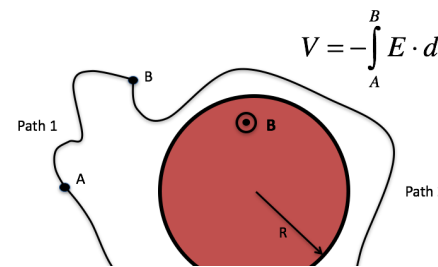E. Not enough information to tell if zero or non-zero

The current in an infinite solenoid with uniform magnetic field $\mathbf{B}$ inside is increasing so that the magnitude B in increasing with time as $B = B_0 + kt$. A small circular loop of radius r is placed outside the solenoid as shown.

What is the emf around the small loop? (Assume CW is the positive direction of current flow).

A. $k\pi r^2$

B. $-k\pi r^2$

C. Zero

D. Nonzero, but need more information for value

E. Not enough information to tell if zero or non-zero

The current in an infinite solenoid of radius R with uniform magnetic field $\mathbf{B}$ inside is increasing so that the magnitude B in increasing with time as $B = B_0 + kt$. If I calculate V along path 1 and path 2 between points A and B, do I get the same answer?

$$V = -\int_A^B E \cdot dl$$

Path 1

Path 2

A. Yes

B. No

C. Need more information

The current in an infinite solenoid with uniform magnetic field $\mathbf{B}$ inside is increasing so that the magnitude B in increasing with time as $B = B_0 + kt$. A small circular loop of radius r is placed coaxially inside the solenoid as shown. Without calculating anything, determine the direction of the induced magnetic field created by the induced current in the loop, in the plane region inside the loop?
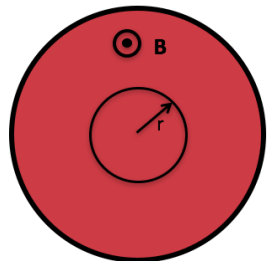
A. Into the screen

B. Out of the screen

C. CW

D. CCW

E. Not enough information