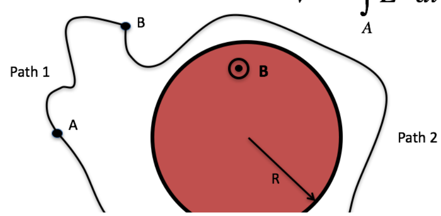
The current in an infinite solenoid of radius R with uniform magnetic field $\mathbf{B}$ inside is increasing so that the magnitude B in increasing with time as $B = B_0 + kt$. If I calculate V along path 1 and path 2 between points A and B, do I get the same answer?

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



A. Yes
B. No
C. Need more information

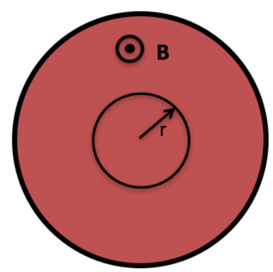
ANNOUNCEMENTS

- Homework 4 is posted
  - Due in class on Friday!
  - Project problem - starting to write your paper (give yourself time to write).
- Quiz 2 - This 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

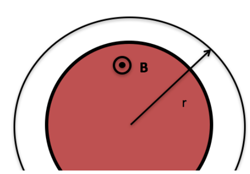
The current in an infinite solenoid with uniform magnetic field $\mathbf{B}$ inside is increasing so that the magnitude B in increasing with time as $B = B_0 + kt$.

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?

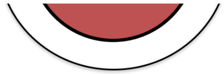
A. Into the screen
B. Out of the screen
C. CW
D. CCW
E. Not enough information



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



A. CW
B. CCW
C. The induced E is zero
D. Not enough information



A long solenoid of cross sectional area, A, creates a magnetic field, $B_0(t)$ that is spatially uniform inside and zero outside the solenoid. SO:

A. $E = \dfrac{\mu_0 I}{2\pi r}$

B. $E = -A\dfrac{\partial B}{\partial t}\dfrac{1}{\pi r^2}$

C. $E = -A 2\pi r \dfrac{\partial B}{\partial t}$

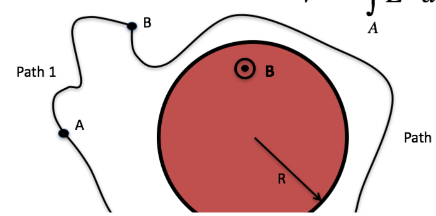
D. $E = -A\dfrac{\partial B}{\partial t}\dfrac{1}{...}$

D. $E = -A\dfrac{\partial B}{\partial t}\dfrac{1}{2\pi r}$

E. Something else

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?

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



A. Yes

B. No

C. Need more information

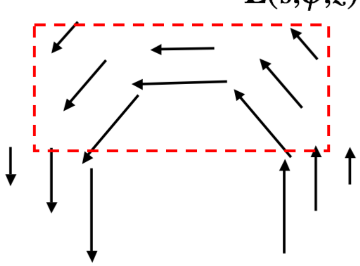
If the arrows represent an E field, is the rate of change in magnetic flux (perpendicular to the page) through the dashed region zero or nonzero?

A. $\dfrac{d\Phi}{dt} = 0$

B. $\dfrac{d\Phi}{dt} \neq 0$

C. ???

$$\vec{\mathbf{E}}(s,\varphi,z) = \frac{c}{s}\,\hat{\varphi}$$



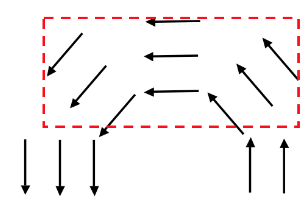
If the arrows represent an E field (note that |E| is the same everywhere), is the rate of change in magnetic flux (perpendicular to the page) in the dashed region zero or nonzero?

A. $\dfrac{d\Phi}{dt} = 0$

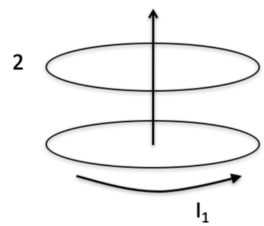
B. $\dfrac{d\Phi}{dt} \neq 0$

C. Need more information

$$\vec{\mathbf{E}} = E_0\,\hat{\varphi}$$

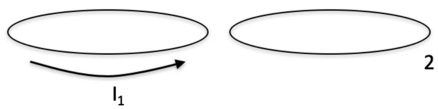


The current I_1 in loop 1 is increasing. What is the direction of the induced current in loop 2, which is co-axial with loop 1?



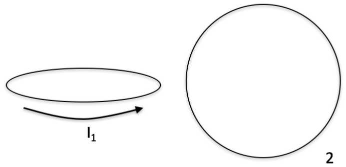
A. The same direction as I_1
B. The opposite direction as I_1
C. There is no induced current
D. Need more information

The current I_1 in loop 1 is increasing. What is the direction of the induced current in loop 2, which lies in the same plane as loop 1?



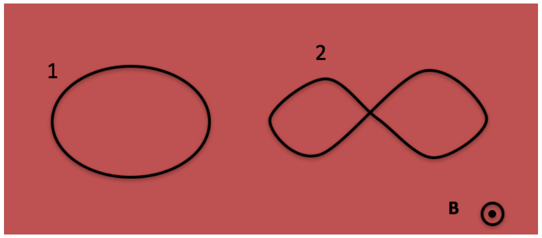
A. The same direction as I_1
B. The opposite direction as I_1
C. There is no induced current
D. Need more information

The current I_1 in loop 1 is decreasing. What is the direction of the induced current in loop 2, which lies in a plane perpendicular to loop 1 and contains the center of loop 1?



A. The same direction as I_1
B. The opposite direction as I_1
C. There is no induced current
D. Need more information

Two flat loops of equal area sit in a uniform field $\mathbf{B}$ which is increasing in magnitude. In which loop is the induced current the largest? (The two wires are insulated from each other at the crossover point in loop 2.)

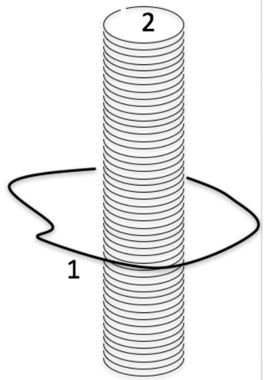


A. Loop 1
B. Loop 2
C. They are both the same
D. Not enough info

A loop of wire 1 is around a very long solenoid 2.

$\Phi_1 = M_{12} I_2$ = the flux through loop 1 due to the current in the solenoid

$\Phi_2 = M_{21} I_1$ = the flux through the solenoid due to the current in loop 1



Which is easier to compute?

A. M_{12}
B. M_{21}
C. equally difficult to compute