Name:

0 point(s)
Amperian Symmetry
In the context of Ampere's law, which of these statements is enough by itself to conclude that $\oint \vec{B} \cdot \mathrm{d}\vec{\ell} = B\ell$?

A. $\vec{B} \parallel \mathrm{d}\vec{\ell}$ and the magnitude of $\vec{B}$ is constant along the Amperian loop.
B. $\vec{B} \perp \mathrm{d}\vec{\ell}$ all along the Amperian loop.
C. $\vec{B} \perp \mathrm{d}\vec{\ell}$ and the magnitude of $\vec{B}$ is constant along the Amperian loop.
D. $\vec{B}$ is constant in magnitude all along the Amperian loop.
E. $\vec{B} \parallel \mathrm{d}\vec{\ell}$ all along the Amperian loop.

Tries 0/10

Answer for Part: 0	• true • false • false • false • false

0 point(s)
Charge in a B Field
A 2.50 kg particle carrying a charge of 75.0 μC enters a uniform region of magnetic field, $\vec{B} = B_0\hat{k}$, where $B_0 = 8.00$ T. The charged particle has a velocity, $\vec{v} = v_x\hat{\imath} + v_z\hat{k}$, where $v_x = 3.0$ m/s and $v_z = 4.0$ m/s. Which statement below is TRUE?

A. There is no force exerted on the charged particle by the magnetic field.
B. The work done on the charged particle by the magnetic field decreases its kinetic energy.
C. The kinetic energy of the charged particle is 31.25 J both before and after entering the uniform region of magnetic field.
D. The magnitude of the net force exerted on the charged particle by the magnetic field is 3×10^{-3} N.
E. The work done on the charged particle by the magnetic field increases its kinetic energy.

Tries 0/10

Answer for Part: 0	• false • false • true • false • false

0 point(s)
Lightning Bolt
Assume that a lightning bolt can be represented by a long straight line of current. If 15.0 C of charge passes by in a time of $1.5 \cdot 10^{-3}$s, what is the magnitude of the magnetic field at a distance of 22.0 m from the bolt?

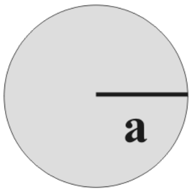
Tries 0/10

Answer for Part: 0	• 8.333E-05 [8.16666666666666e-05 8.5e-05] Sig 3 - 5 • Unit: T

0 point(s)

Uniform current wire

We have a long wire with a circular cross section and radius $a = 1.80$ cm. The current density in this wire is uniform, with a total current of 5.00 A. Find the magnitude of the magnetic field at a distance of 0.54 cm from the center axis. Treat the wire as a cylinder. The picture is of a circular cross-section of that cylinder.



Tries 0/10

Answer for Part: 0	• 1.30E-05 [1.27826086956522e-05 1.3304347826087e-05] • Unit: T

0 point(s)

Rotating Bar in uniform B Field

A 2.00 m long rod rotates about an axis through one end and perpendicular to the rod, with a rotational frequency ω of 24.50 radians per second. The plane of rotation of the rod is perpendicular to a uniform magnetic field of 1.00 T. Calculate the magnitude of the ϵmf induced between the ends of the rod.

Tries 0/10

Answer for Part: 0	• 4.90E+01 [48.5187569420408 49.4989338499608] • Unit: V

0 point(s)

Force on a Cosine Wire

A wire segment carrying a current I is bent into a cosine shape with period of 2π, i.e., $y = \cos(x)$ and the wire has length 4π in the $x-$direction. There is a magnetic field in the vicinity of the wire which points in the positive $z-$direction with a magnitude given by $B = B_0 x$. What is the magnitude of the $y-$component of the force on the wire segment?

A. $|F_y| = \left|8\pi^2 I B_o\right|$
B. $|F_y| = 0$
C. $|F_y| = \left|16\pi^2 I B_o\right|$
D. $|F_y| = \left|\frac{I B_o}{4\pi^2}\right|$
E. $|F_y| = |4\pi I B_o|$

Tries 0/10

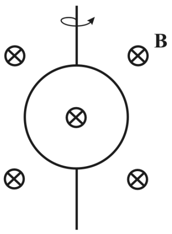
Answer for Part: 0	• true • false • false • false • false

0 point(s)
Square Wire Torque
A 138.0 cm wire carries a current of 5.50 A. The wire is formed into a square loop and placed in a magnetic field of intensity 3.60 T. Find the maximum torque that can act on the square current loop.

Tries 0/10

Answer for Part: 0	• 4.63E-01 [0.4579245 0.4671755] • Unit: N*m

0 point(s)
Spinning Loop
We have a single loop of wire of area A rotating about an axis with some angular speed ω. There is a uniform magnetic field of magnitude B pointing into the page. At $t = 0$, the loop is completely in the plane of the page as shown. What is the magnitude of the maximum emf induced in the loop as it spins?

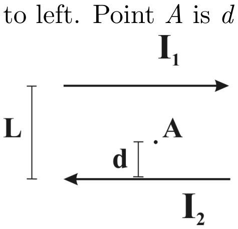


A. $BAcos(\omega t)$
B. $\omega BAcos(\omega t)$
C. Zero
D. $\omega sin(\omega t)$
E. None of the above

Tries 0/10

Answer for Part: 0	• false • false • false • false • true

0 point(s)
Antiparallel currents
Two long parallel wires are shown in the figure below. They are separated by a distance $L = 10.00$ cm. The top wire carries a current of 1.50 A flowing from left to right. The bottom wire carries a current of 4.00 A flowing from right to left. Point A is $d = 8.00$ cm above the bottom wire. The drawing is not necessarily to scale.



What is the magnitude of the total magnetic field at point A?

Tries 0/10

What is the direction of this field?

A. Into the page
B. To the left
C. To the right
D. Up
E. Down

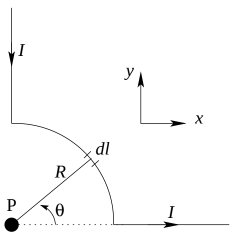
Tries 0/10

Answer for Part: `Magnitude`	• `2.50E-05 [2.45e-05 2.55e-05]` • `Unit: T`
Answer for Part: `Direction`	• `true` • `false` • `false` • `false` • `false`

0 point(s)

integrateWire.problem

Consider the current-carrying segments of wire shown below.



The vector $d\vec{\ell}$ shown, used to calculate the magnetic field at point P, is given by

A. $d\vec{\ell} = R\cos\theta\, d\theta\hat{\imath} + R\sin\theta\, d\theta\hat{\jmath}$
B. $d\vec{\ell} = R\, d\theta\hat{\imath} - R\, d\theta\hat{\jmath}$
C. $d\vec{\ell} = R\sin\theta\, d\theta\hat{\imath} - R\cos\theta\, d\theta\hat{\jmath}$
D. $d\vec{\ell} = R\sin\theta\, d\theta\hat{\imath} + R\cos\theta\, d\theta\hat{\jmath}$
E. None of the above.

Tries 0/10

The r-vector used in the Biot-Savart law to calculate the magnetic field at point P due to the segment $d\vec{\ell}$ is

A. $-R\cos\theta\hat{\imath} - R\sin\theta\hat{\jmath}$
B. $R\theta\hat{\imath} + R\theta\hat{\jmath}$
C. $R\cos\theta\hat{\imath} + R\sin\theta\hat{\jmath}$
D. $-R\sin\theta\hat{\imath} - R\cos\theta\hat{\jmath}$
E. None of the above.

Tries 0/10

Calculate the *total* vector magnetic field at point P due to all segments of the wire shown.

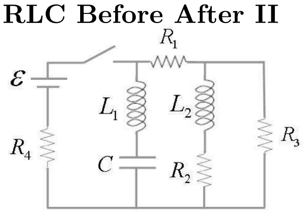
A. $\vec{B} = \frac{\mu_0 I}{4R}\hat{k}$
B. $\vec{B} = \frac{\mu_0 I}{8R}(-\hat{k})$
C. $\vec{B} = \frac{\mu_0 I}{4R}(-\hat{k})$
D. $\vec{B} = \frac{\mu_0 I}{8R}\hat{k}$
E. None of the above.

Tries 0/10

Answer for Part: `dl`	• `false` • `false` • `true` • `false` • `false`
Answer for Part: `rVector`	• `true` • `false` • `false` • `false` • `false`
Answer for Part: `Bfield`	• `false` • `true` • `false` • `false` • `false`

0 point(s)

RLC Before After II



Consider the circuit shown in the figure above. The switch has been open for a very long time, and then we close it. Rank the magnitudes of the currents through resistors R_1, R_2, R_3, and R_4 from greatest to least, in the instant right after we close the switch. Assume that $R_1 > R_2 > R_3 > R_4$.

A. $I_4 > I_3 > I_2 > I_1$
B. $I_1 = I_3 = I_4 > I_2$
C. $I_1 > I_3 > I_4 > I_2$
D. $I_1 = I_3 > I_4 > I_2$
E. None of the above

Tries 0/10

The switch has been open for a very long time, and then we close it. In the instant right after we close the switch, assuming that $R_1 > R_2 > R_3 > R_4$, what is the total current through the circuit?

A. $I_T = \dfrac{\epsilon}{R_1 + R_2 + R_3 + R_4}$

B. $I_T = \dfrac{\epsilon}{(\frac{1}{R_2} + \frac{1}{R_3})^{-1} + (\frac{1}{R_1} + \frac{1}{R_4})^{-1}}$

C. $I_T = \dfrac{\epsilon}{R_1 + (\frac{1}{R_2} + \frac{1}{R_3})^{-1} + R_4}$

D. $I_T = \dfrac{\epsilon}{R_1 + R_3 + R_4}$

E. None of the above

Tries 0/10

Answer for Part: `Before`	• `false` • `false` • `true` • `false` • `false`
Answer for Part: `Before2`	• `true` • `false` • `false` • `false` • `false`

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0 point(s)

Migrating Birds 3

It is known that birds can detect the earth's magnetic field, but the mechanism by which they do this is not known. It has been suggested that perhaps they detect a motional emf as they fly north to south, but it turns out that the induced voltages are small compared to the voltages normally encountered in cells, so this is probably not the mechanism involved.

To check this out, calculate the induced voltage for a wild goose with a wingspan of $\ell = 1.20$ m at level flight due south at $v = 11.50$ m/s at a point where the earth's magnetic field is 1.00E-5 T directed straight down into the earth. What would be the expected voltage difference across the goose's wingtips?

[ ]

Tries 0/10

Answer for Part: `Voltage`	• `1.47E-04 [0.00014553 0.00014847]` • `Unit: V`

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0 point(s)

uncertaintyQuestion.problem

When trying to determine the maximum magnetic field created by your 19-turn field coil in the Faraday's law lab, you measure the maximum current to be 0.1 ± 0.07 A, and the radius of your coil to be 0.05 ± 0.001 m. If these are the only uncertainties, what is the total uncertainty in the maximum magnetic field? [ ]

Tries 0/10

Answer for Part: `0`	• `1.67198284788435e-05 [1.58838370549013e-05 1.75558199027857e-05] Sig 0 - 15`

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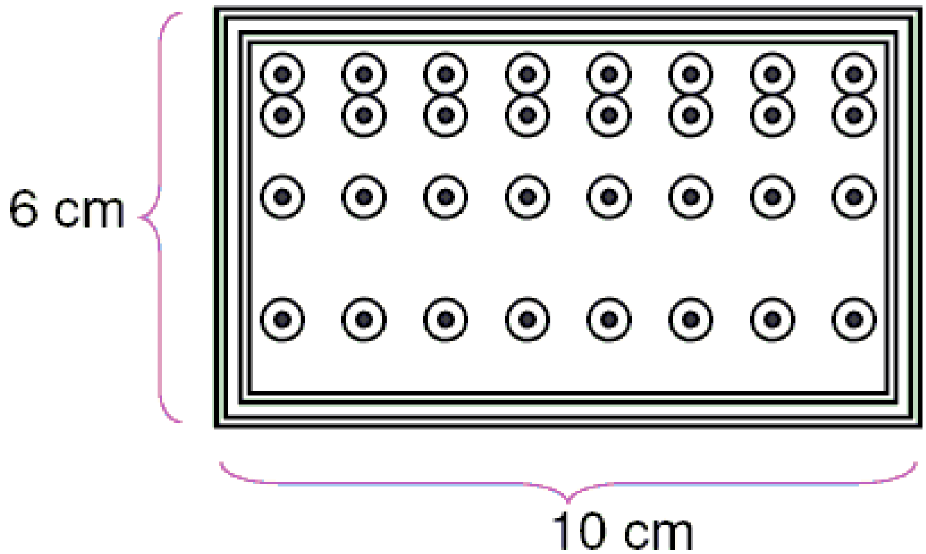
0 point(s)

Four Turn Coil



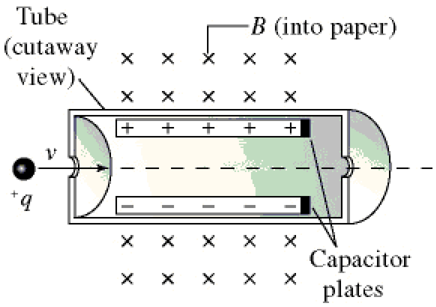
A four-turn rectangular coil has a spatially varying magnetic field directed through its center as shown. The magnetic field is given by $\vec{B} = 4.2\, y^2\, t\, \hat{k}$, where B is in Tesla when t is in s and y is in m. Find the magnitude of the induced emf in the coil.

$emf =$ ______

Tries 0/10

Answer for Part: `voltage`	• `1.21E-04 [0.000119592 0.000122008]` • `Unit: V`

0 point(s)
Velocity Selector 2
In the figure below is a velocity selector that can be used to measure the speed of a charged particle. A beam of particles is directed along the axis of the instrument. A parallel plate capacitor sets up an electric field E, which is oriented perpendicular to a uniform magnetic field B. If the plates are separated by 8 mm and the value of the magnetic field is 0.3 T, what voltage between the plates will allow particles of speed 5×10^5m/s to pass straight through without deflection?



A. 3800 V
B. 380 V
C. 190 V
D. 7500 V
E. 1200 V

Tries 0/10

Answer for Part: 0	
	• false • true • false • false • false

