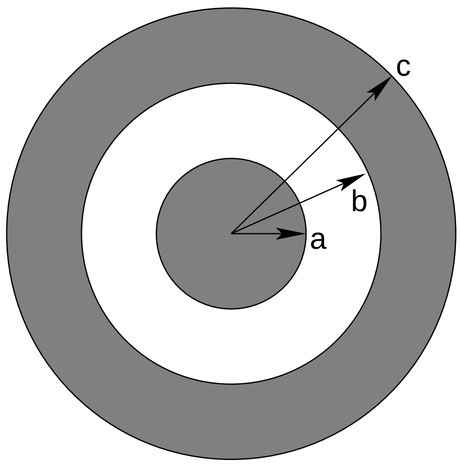
Name:

0 point(s)
Coaxial Cable
A long coaxial cable consists of two concentric conductors with dimensions $a = 2.00$ cm, $b = 4.90$ cm and $c = 6.60$ cm. There are equal and opposite uniform currents of 5.00 A in the conductors. Find the magnitude of the magnetic field at a distance of 0.60 cm from the center axis.



Tries 0/10

Answer for Part: 0	• 1.50E-05 [1.47e-05 1.53e-05] • Unit: T

0 point(s)
Migrating Birds
It is known that birds can detect the earth's magnetic field, but the mechanism of how 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 1.4 m at level flight due south at 13 m/s at a point where the earth's magnetic field is 5×10^{-5} T directed downward from horizontal by 16°. What would be the expected voltage difference across the goose' wingtips?

A. 0.87 mV
B. 0.13 mV
C. 0.91 mV
D. 0.25 mV
E. 0.087 mV

Tries 0/10

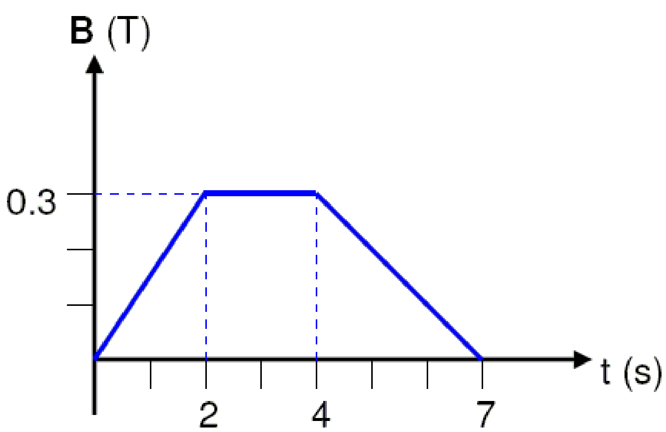
Answer for Part: 0	• true • false • false • false • false

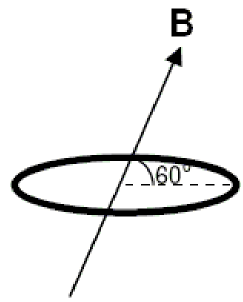
0 point(s)
Rotating Bar in uniform B Field
A 2.20 m long rod rotates about an axis through one end and perpendicular to the rod, with a rotational frequency ω of 15.71 radians per second. The plane of rotation of the rod is perpendicular to a uniform magnetic field of 0.70 T. Calculate the magnitude of the emf induced between the ends of the rod. [ ]

Tries 0/10

Answer for Part: 0	• 2.66E+01 [26.3431968781465 26.8753826736647] • Unit: V

0 point(s)
Graphical Analysis
The magnetic field through a 25 turn, 0.15 m radius coil varies with respect to time according to the graph shown below. The field lines make an angle of 60^0 with respect to the coil plane.





What is the magnitude of the induced emf for the time interval 0 - 2 seconds?

$emf =$ [ ]

Tries 0/10

What is the direction of the induced current for the time interval 0 - 2 seconds?

Choices: **Counter-clockwise as seen from above**, **Clockwise as seen from above**, **No current**.

Tries 0/10

Answer for Part: InducedV1	• 2.30E-01 [0.227263392215534 0.231854571856252] • Unit: V
Answer for Part: InducedV1direction	• Clockwise as seen from above

0 point(s)

Solenoid Through Coil

A 24.5 cm long solenoid has 37 windings and a circular cross section of radius $a = 1.50$ cm. The solenoid goes through the center of a circular coil of wire with 23 windings and radius $b = 7.00$ cm. The current in the circular coil changes according to $i(t) = 8.0\ t^2 + 2.5\ t$.

What is the mutual inductance of the coil and solenoid?

Tries 0/10

Answer for Part: `MutualInductance`	• `3.36E-05 [3.32601720474951e-05 3.39320947151213e-05]` • `Unit: H`

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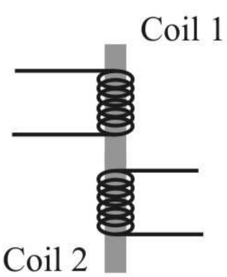
0 point(s)

Transformer Two

The picture below shows a crude transformer, a device for transferring electrical energy from one circuit to another. Solenoid 1 is wrapped tightly around an iron bar, guaranteeing that any magnetic field produced by solenoid 1 will be transmitted exactly down to solenoid 2. Solenoid 1 has 120 turns and solenoid 2 has 160 turns. There's a typical 12 V car battery hooked up to the input coil. Calculate the rms voltage that will be induced in solenoid 2.



A. 9.00 V
B. 16.00 V
C. 11.31 V
D. 0 V

Tries 0/10

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

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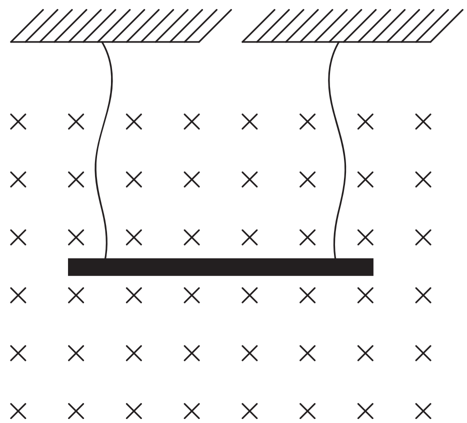
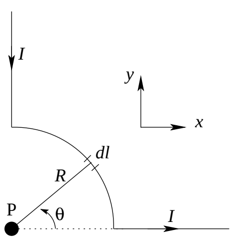
0 point(s)
Hanging Wire
A conducting bar of length 0.40 m and mass 32.0 g is suspended by a pair of flexible leads in a uniform 0.80 T magnetic field (directed into the page) as shown in the figure. What is the current required to remove the tension in the supporting leads?



Tries 0/10

Answer for Part: 0	• 9.81E-01 [0.97085835 0.99047165] • Unit: A

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. $d\vec{\ell} = R\sin\theta\, d\theta\hat{\imath} + R\cos\theta\, d\theta\hat{\jmath}$
B. $d\vec{\ell} = R\sin\theta\, d\theta\hat{\imath} - R\cos\theta\, d\theta\hat{\jmath}$
C. $d\vec{\ell} = R\cos\theta\, d\theta\hat{\imath} + R\sin\theta\, d\theta\hat{\jmath}$
D. $d\vec{\ell} = R\, d\theta\hat{\imath} - R\, d\theta\hat{\jmath}$
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. $-R\sin\theta\hat{\imath} - R\cos\theta\hat{\jmath}$
C. $R\theta\hat{\imath} + R\theta\hat{\jmath}$
D. $-R\cos\theta\hat{\imath} - R\sin\theta\hat{\jmath}$
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` • `true` • `false` • `false` • `false`
Answer for Part: `rVector`	• `false` • `false` • `false` • `true` • `false`
Answer for Part: `Bfield`	• `false` • `false` • `false` • `true` • `false`

0 point(s)

Coil Uncertainty

When trying to determine the maximum magnetic field created by your 29-turn field coil in the Faraday's law lab, you measure the maximum current to be 0.5 ± 0.05 A, and the radius of your coil to be 0.06 ± 0.004 m. If these are the only uncertainties, what is the total uncertainty in the maximum magnetic field? ________

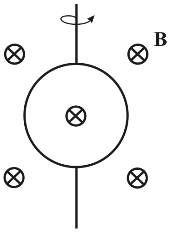
Tries 0/10

Answer for Part: `0`	• `1.79061260153883e-05 [1.70108197146189e-05 1.88014323161577e-05] Sig 0 - 15`

0 point(s)

Spinning Loop Ranking

We have N loops of wire of rotating about an axis with some angular speed ω. There is a uniform magnetic field of magnitude B pointing into the page. Different combinations of N, ω, and B will give us different induced voltages.



Rank the magnitudes of the peak voltages that will be generated in the following four scenarios.

I) B is 2 T, ω is 60 rad/s, and N is 20 loops.
II) B is 1 T, ω is 120 rad/s, and N is 20 loops.
III) B is 2 T, ω is 120 rad/s, and N is 10 loops.
IV) B is 4 T, ω is 15 rad/s, and N is 40 loops.

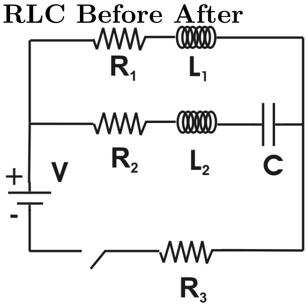
A. II = III > I > IV
B. I = IV > II = III
C. IV > II > I > III
D. I = II = III = IV
E. None of these are true

Tries 0/10

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

0 point(s)

RLC Before After



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, and R_3, from greatest to least, in the instant right after we close the switch. Assume that $R_1 > R_2 > R_3$.

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

Tries 0/10

Rank the currents through the three resistors after the switch has been closed for a very long time.

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

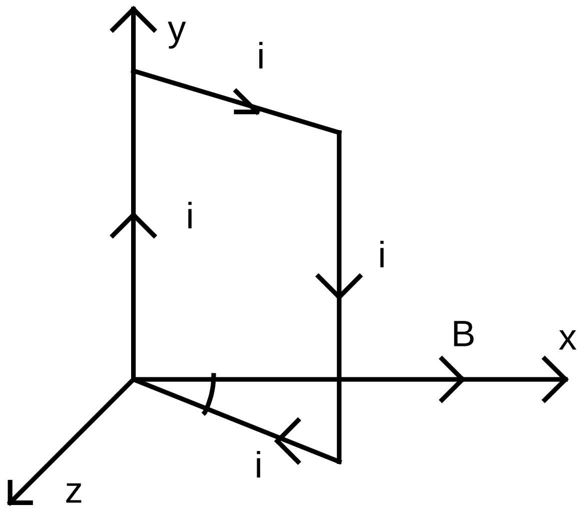
Tries 0/10

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

0 point(s)

Torque On Square Loop

The figure shows a rectangular loop of wire of 100 turns, 17.0 cm by 26.0 cm. It carries a current of 1.76 A and is hinged at one side. What is the magnitude of the torque that acts on the loop, if it is mounted with its plane at an angle of 29.0 degrees to the direction of **B**, which is uniform and equal to 0.30 T?



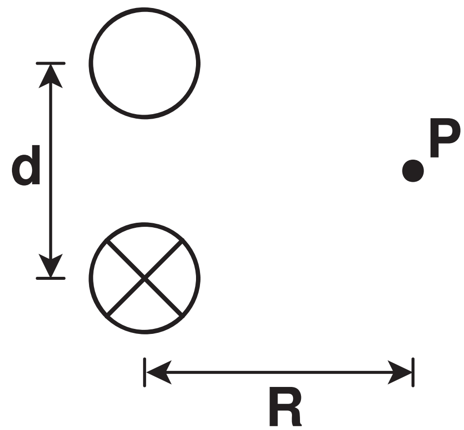
Tries 0/10

Answer for Part: 0	• 2.04 [2.0207409628563 2.06156401261098] • Unit: N*m

0 point(s)

Two Parallel Wires

Two long parallel wires are a center-to-center distance of 3.30 cm apart and carry equal anti-parallel currents of 5.30 A. Find the magnitude of the magnetic field at the point P which is equidistant from the wires. (R = 7.00 cm).



Tries 0/10

Answer for Part: `0`	• `8.15E-06 [7.98309592334876e-06 8.30893657328136e-06]` • `Unit: T`

0 point(s)

Thomson Charge To Mass

An electron in J. J. Thomson's e/m apparatus moves perpendicular to a **B**-field along a circular path of radius 18.10 cm. If imposition of an **E**-field of 21.70 kV/m makes the path straight, what is the value of **B**?

Tries 0/10

Answer for Part: `OriginalQuestion`	• `8.2562E-04 [0.000817363191926224 0.000833875579641906]` • `Unit: T`

0 point(s)
Charge in a B Field
A 2.50 kg particle carrying a charge of $75.0\,\mu$C 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. The kinetic energy of the charged particle is 31.25 J both before and after entering the uniform region of magnetic field.
B. The work done on the charged particle by the magnetic field increases its kinetic energy.
C. There is no force exerted on the charged particle by the 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 decreases its kinetic energy.

Tries 0/10

Answer for Part: 0	`true` `false` `false` `false` `false`

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

Tries 0/10

Answer for Part: 0	`true` `false` `false` `false` `false`

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20 point(s)
Exam 3 free response
You have 0.00 out of 20 possible points.

Tries 0/10

