

A

Physics 2212 K Summer 2015

Recitation Section:_____

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|---------|---------------------------------------|-------|-------------------------------------|
| e | Fundamental charge | m_e | Mass of an electron |
| μ_0 | Permeability constant | c | Speed of light |
| K | Coulomb constant $= 1/4\pi\epsilon_0$ | g | Magnitude of Free Fall Acceleration |

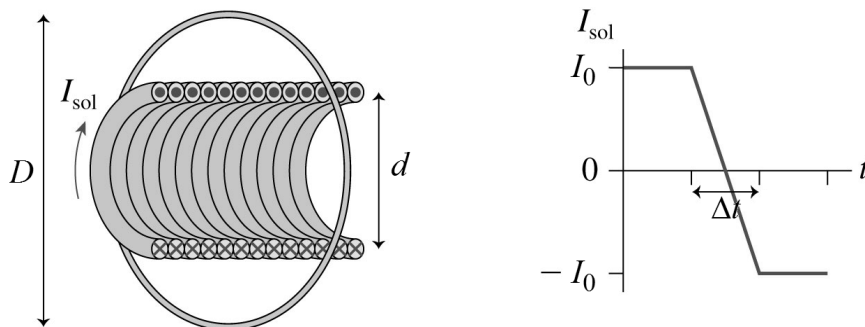
Any integrals in free-response problems must be evaluated. Questions about magnitudes will state so explicitly.

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Recitation Sections

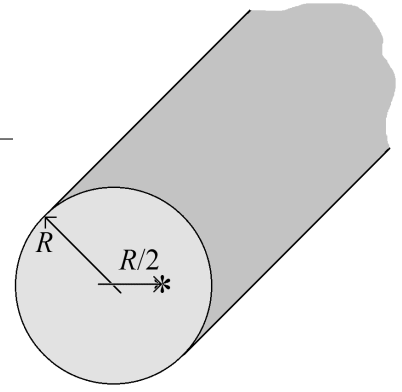
	Room 125
TUESDAY	
2:20–3:10 pm	K04 Sharma, Kamal
3:20–4:10 pm	K03 Sharma, Kamal
4:20–5:10 pm	K01 Koh, Daegene
WEDNESDAY	
2:20–3:10 pm	K06 Krygier, Michael
3:20–4:10 pm	K05 Krygier, Michael
4:20–5:10 pm	K02 Koh, Daegene
THURSDAY	
2:20–3:10 pm	K08 Nguyen, Khai
3:20–4:10 pm	
4:20–5:10 pm	K09 Nguyen, Khai

- I. (20 points) A loop with diameter D and resistance R surrounds an ideal solenoid with diameter d . The solenoid has length L , has N turns, and carries the current shown in the graph, which changes from $+I_0$ to $-I_0$ in time Δt . A positive current is clockwise when seen from the left. Determine the magnitude of the current in the loop at the instant the current in the solenoid is zero. Express your answer in terms of parameters defined in the problem, and physical or mathematical constants.



1. (6 points) In the problem above, what is the direction of the current, if any, in the loop during the time Δt ?
 - (a) Only counter-clockwise.
 - (b) First clockwise, then counter-clockwise.
 - (c) No direction, as current is zero.
 - (d) First counter-clockwise, then clockwise.
 - (e) Only clockwise.

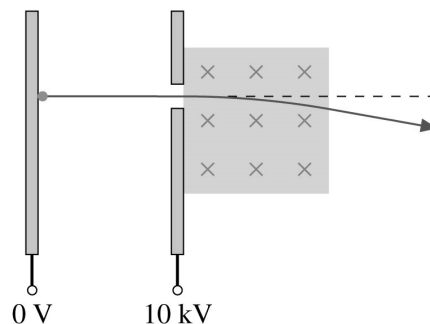
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- II. (20 points) A long, straight, cylindrical conductor of radius R carries a uniform current I out of the page. What is the magnitude of the magnetic field at the asterisk, a distance $R/2$ from the cylinder's axis? Express your answer in terms of parameters defined in the problem, and physical or mathematical constants.



2. (6 points) In the problem above, what is the direction of the magnetic field at the asterisk?
- (a) Down the page.
 - (b) Out of the page.
 - (c) Up the page.
 - (d) Into the page.
 - (e) To the right.

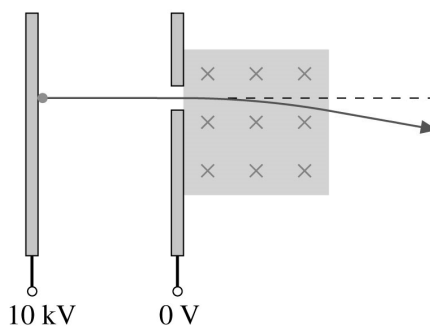
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3. (6 points) Consider a particle that is released from rest at the 0 V plate of a capacitor. It accelerates toward the 10 kV plate, and passes through a small hole. Entering a uniform magnetic field directed into the page, its path is deflected down the page. Under what circumstances, if any, is this possible?

- (a) This is possible if the particle is neutral.
- (b) This is possible if the particle has positive charge or has negative charge (that is, as long as the particle isn't neutral).
- (c) This is not possible.
- (d) This is possible if the particle has negative charge.
- (e) This is possible if the particle has positive charge.



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4. (6 points) Consider a particle that is released from rest at the 10 kV plate of a capacitor. It accelerates toward the 0 V plate, and passes through a small hole. Entering a uniform magnetic field directed into the page, its path is deflected down the page. Under what circumstances, if any, is this possible?

- (a) This is possible if the particle has positive charge.
- (b) This is possible if the particle has negative charge.
- (c) This is possible if the particle has positive charge or has negative charge (that is, as long as the particle isn't neutral).
- (d) This is not possible.
- (e) This is possible if the particle is neutral.



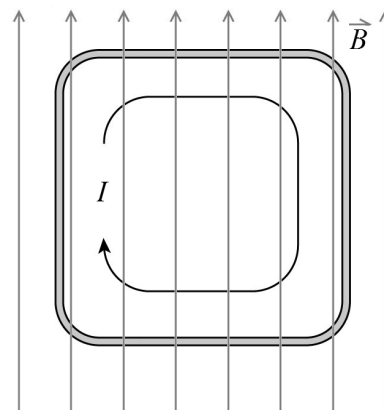
5. (6 points) Current is flowing through the inductor from b to a and increasing in magnitude. What is the polarity of the inductor? Is it supplying or storing energy?

- (a) Point b is at higher potential than point a . The inductor is supplying energy.
- (b) Point a is at higher potential than point b . The inductor is storing energy.
- (c) Point a is at higher potential than point b . The inductor is supplying energy.
- (d) Point b is at higher potential than point a . The inductor is storing energy.



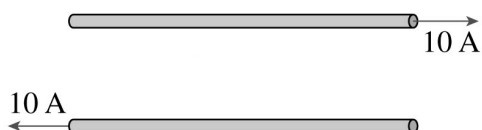
6. (6 points) The loop lies in the plane of the page, and current flows clockwise around it. A uniform magnetic field points up the page. If there is a net torque on the loop, which side of the loop would tend to come out of the page toward you?

- (a) The bottom side.
- (b) There is no net torque on the loop.
- (c) The right side.
- (d) The left side.
- (e) The top side.



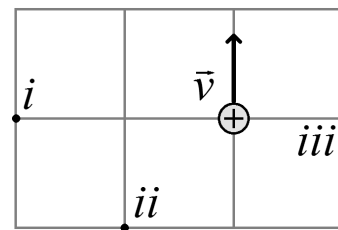
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7. (6 points) When the current in each of the long straight wires shown is 10 A, each wire experiences a force magnitude F_0 . Describe the forces on the wires if the current in the bottom wire is increased to 20 A.

- (a) There is a force $2F_0$ downward on the top wire, and a force F_0 upward on the bottom wire.
- (b) There is a force $2F_0$ downward on the top wire, and a force $2F_0$ upward on the bottom wire.
- (c) There is a force F_0 upward on the top wire, and a force $2F_0$ downward on the bottom wire.
- (d) There is a force $2F_0$ upward on the top wire, and a force $2F_0$ downward on the bottom wire.
- (e) There is a force F_0 downward on the top wire, and a force $2F_0$ upward on the bottom wire.



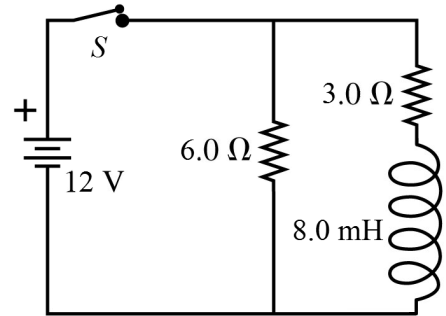
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8. (6 points) A positively-charged particle is moving up the page with velocity $\vec{v}$. Rank the magnetic field magnitudes at points i , ii , and iii , from greatest to least.

- (a) $iii > i = ii$
- (b) $iii > i > ii$
- (c) $iii > ii > i$
- (d) $i = ii > iii$
- (e) $i > ii > iii$



9. (6 points) The switch S has been closed for a long time. What current is supplied by the battery?

- (a) 6.0 A
- (b) 2.0 A
- (c) 3.0 A
- (d) 4.0 A
- (e) 1.0 A



10. (6 points) The switch S has been open for a long time. Immediately upon closing it, what current is supplied by the battery?

- (a) 3.0 A
- (b) 6.0 A
- (c) 2.0 A
- (d) 4.0 A
- (e) 1.0 A

