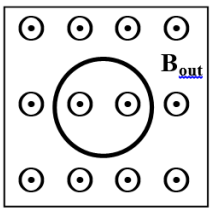
**Physics 2135 Test Preparation Homework #3, Spring 2017**

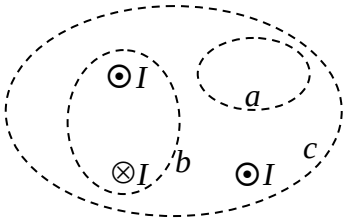
These problems are intended to help you verify your level of preparation for Test 3. ***They are not intended to cover every topic you could be tested on, nor are they a guarantee of test 3 content. Make sure you also work the problems in the exam 3 review lecture!***

**Multiple Choice**



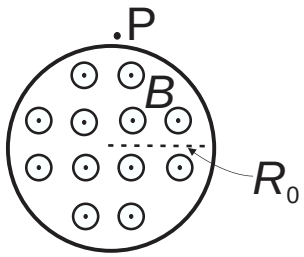

_____1. A single circular loop of wire is perpendicular to a uniform magnetic field $\mathbf{B}_{out}$ directed out of the page as shown. If the magnitude of the field is *decreasing*, then the induced current in the wire is directed

[A] out of the page. [B] into the page.
[C] clockwise around the loop. [D] counterclockwise around the loop.




_____ 2. The three wires shown carry identical currents $I$ in the directions indicated. For which of the three paths a, b, and c is the line integral $\oint \vec{B} \bullet d\vec{s}$ equal to zero?

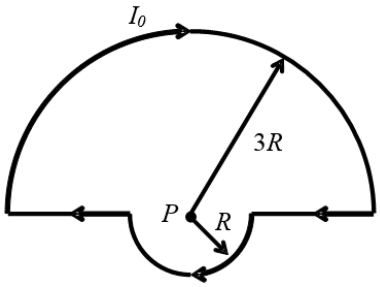
[A] *a* only [B] *a* and *b*
[C] *b* and *c* [D] *a*, *b*, and *c*



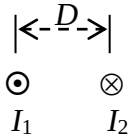

_____ 3. A uniform magnetic field points out of the page and is restricted to a cylindrical region of radius $R_0$ as shown in the picture. The magnitude $B$ of the field decreases with time. What is the direction of the electric field induced at point P just outside the magnetic field region?

[A] into the page [B] out of the page
[C] clockwise [D] counter-clockwise
[E] no electric field outside the *B*-field region

**Problems**

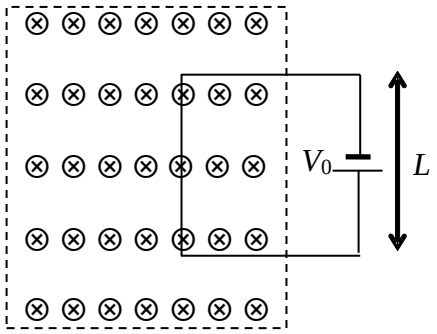



4. A length of wire is formed into a shape consisting of a semicircle of radius 3$R$ and a second semicircle of radius $R$. The semicircles are connected by straight horizontal segments and both semicircles are centered at point $P$. The wire carries current $I_0$ in the direction shown. Determine the magnitude **and** direction of the magnetic field at point $P$.




5. Two long, parallel straight wires carry currents $I_1$ and $I_2$ in opposite directions and are separated by a distance D. Find the magnitude of the force per unit length between them in terms of relevant constants and the symbols given. Is the force attractive or repulsive?

6. A square conducting coil made of a single loop of wire with sides of length $L$ has a total resistance of $R$. The coil is being pulled to the right out of a region of uniform magnetic field of magnitude $B$ directed into the plane of the paper. The coil is moving with a constant speed $v$. A battery of voltage $V_0$ is connected to the loop as shown.




(a) Calculate the current that flows in the loop.
(b) What direction (clockwise or counterclockwise) does current flow in the loop?
(c) What is the force (magnitude and direction) that must be exerted on the loop to keep it moving with its constant speed?

7. A flat, square solar panel of side $L$ receives solar radiation of power $P_0$. The radiation arrives traveling perpendicular to the surface of the antenna. (a) Calculate the amplitudes of the electric and magnetic fields of the sun's electromagnetic radiation at the antenna. (b) Express the total power output of the sun in terms of $P_0$, $L$ and the distance $R$ between the earth and the sun. (Note here we neglect radiation absorbed or reflected by the earth's atmosphere.) (c) What is the average energy density of solar radiation near the surface of the Earth (express your answer in terms of $P_0$, $L$)?

# Physics 2135 Spring 2017 Exam Rooms
# February 14, March 21, April 18
# 5:00 – 6:00 PM

| Instructor | Sections | Room |
|---|---|---|
| Dr. Hale | F, H | 104 Physics |
| Dr. Kurter | B, N | 125 BCH |
| Dr. Madison | K, M | 199 Toomey |
| Dr. Parris | J, L | B-10 Bertelsmeyer |
| Mr. Upshaw | A, C, E, G | G-3 Schrenk |
| Dr. Waddill | D | 120 BCH |

Special Accommodations  Testing Center

Know the exam time (5:00 pm to 6:00 PM)!
Find your room ahead of time!

These room assignments will be posted on the doors to 104 Physics.

BCH = Butler-Carlton Hall (Civil Engineering)
EECH = Emerson Electric Company Hall

B-10 Bertelsmeyer for March 21 and April 18 exams