PHYS 205-Section 03
Electricity and Magnetism - Winter 2018
Assignment 4 – Due on March 23rd

Instructions

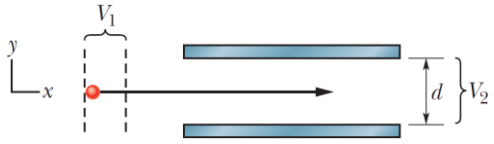
You should hand in your answers, written or typed in standard letter sized papers, in class on the due date (to be posted with the assignment). Make sure to clearly indicate:

1. Your class (PHYS 205/03)
2. The sequence number of the actual assignment (Assignment # 2)
3. The name of your instructor (Nima Nateghi)
4. Your name
5. Your student ID#
6. The due date (Feb. 9th)

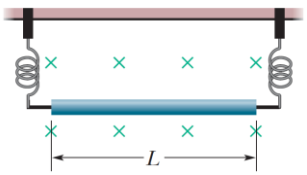
In case of multiple pages **you should staple the pages together** properly. We are not held responsible for lost pages of home works due to inadequate grouping of pages.
In case of **late submission**, drop your assignment in the physics department's dropbox (SP building, 3rd floor). There will be a 20% late submission penalty for each day after the due date. No electronic submission will be accepted. After the answers are posted, not assignments will be accepted (under no circumstances).

Problems

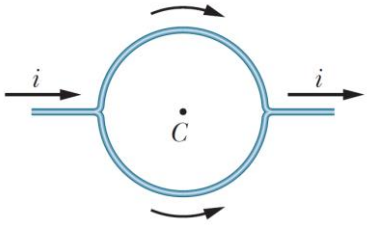
1. In the figure below, an electron accelerated from rest through potential difference $V_1 = 1\ kV$ enters the gap between two parallel plates having separation $d = 20\ mm$ and potential difference $V_2 = 100\ V$. The lower plate is at the lower potential. Assume that the electron's velocity vector is perpendicular to the electric field vector between the plates. In unit-vector notation, what uniform magnetic field allows the electron to travel in a straight line in the gap? **(5 points)**



2. A 13 g wire of length L= 62 cm is suspended by a pair of flexible leads in a uniform magnetic field of magnitude 0.440 T (as shown in the figure).What are the (a) magnitude and (b) direction (left or right) of the current required to remove the tension in the supporting leads? **(5 points)**



3. A straight conductor carrying current $i = 5\ A$ splits into identical semicircular arcs as shown in the figure. What is the magnetic field at the center C of the resulting circular loop? **(5 points)**



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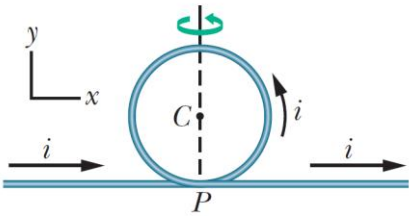
4. In the figure below, part of a long insulated wire carrying current $i = 5.78\ mA$ is bent into a circular section of radius $R = 1.89\ cm$. In unit-vector notation, what is the magnetic field at the center of curvature C if the circular section (a) lies in the plane of the page as shown and (b) is perpendicular to the plane of the page after being rotated 90° counterclockwise as indicated? **(5 points)**



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5. As shown in the figure, a long wire carries a current $i_1 = 30\ A$ and a rectangular loop carries current $i_2 = 20\ A$. Take the dimensions to be $a = 1\ cm$, $b = 8\ cm$, and $L = 30\ cm$. In unit vector notation, what is the net force on the loop due to i_1? **(5 points)**