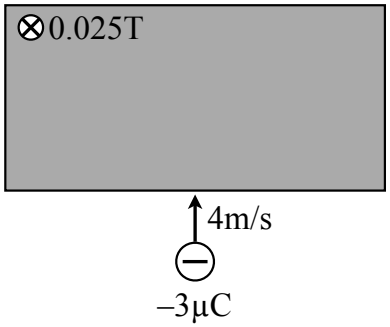
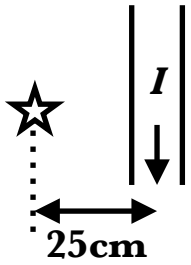
▷ **2.**
A $+5\,\mu$C charge moves southwest at 10 m/s in a magnetic field of $\vec{B} = 50\,\mu$T which points due north. What magnetic force does the charge feel?

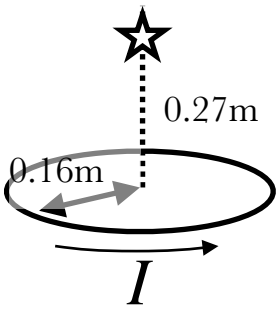
▷ **3.**
A $-3\,\mu$C charge with mass 2 mg is moving through empty space (with $B = 0$) when it hits a region with a uniform magnetic field of 0.025 T pointing into the page.
(a) Find the force at the moment the charge enters the field.
(b) Does the charge ever leave the field? If so, where? How far away? Assume the magnetic field stretches infinitely upward, to the left, and to the right.



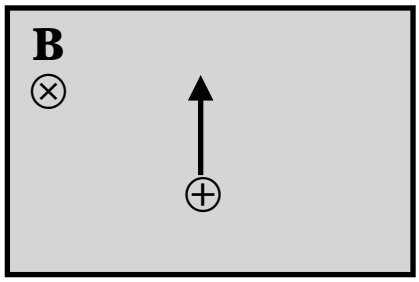
5. What is the magnitude of the magnetic field at the star, if the current in this long, straight wire is I=0.37A?



6. This circular loop of wire has a radius of 0.16m, and carries a current of 0.45A counter-clockwise (as seen from above). What is the magnetic field (**magnitude and direction**) at the star, a distance of 0.27m above the center of the circle?



7. The grey area contains a magnetic field of 3.9×10^{-2}T which points into the page. A +47μC charge with a mass of 2.5×10^{-9}kg is moving at 350m/s upward. What is the force *(magnitude and direction)* on the charge due to the magnetic field?



8. In the picture above, the charge will start spinning in a circle. What will be the radius of the circle? And will the charge spin clockwise ↻ or counterclockwise ↺?

Physics 102 Homework #11

due Sunday, April 17th

Urone Chapter 22.1–22.9

Questions (1 point each)

a) The N pole of the Earth is closer to

A) Canada **B) Australia**

b) If a compass is placed to the right of a magnet's S pole, it will point

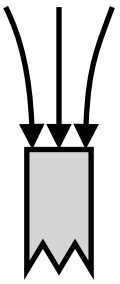
A) to the left ← **B) to the right →**

(b)

c) Which of the following materials is attracted to a magnet? Circle all that are.

A) copper **B) iron** **C) marble**

(d)



d) The picture shows the top of a bar magnet and some of its magnetic field lines. The pole shown is the

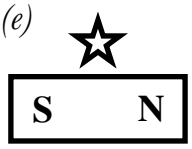
A) N pole **B) S pole**

e) What is direction of the magnetic field at the star, next to this bar magnet?

A) left ← **B) right →**

C) out of the page ⊙ **D) into the page ⊗**

(e)

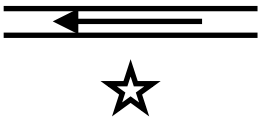


f) What is the direction of the magnetic field at the star, next to this current which goes to the left?

A) left ← **B) right →**

C) out of the page ⊙ **D) into the page ⊗**

(f) *I*

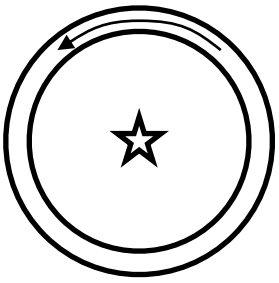


g) What is the direction of the magnetic field at the star, inside this loop of current?

A) left ← **B) right →**

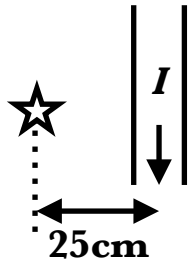
C) out of the page ⊙ **D) into the page ⊗**

(g) *I*

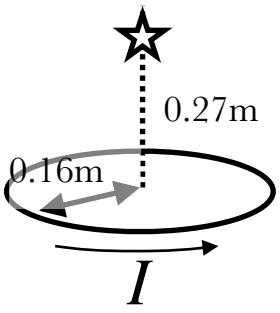


Problems (4 points each)

1. What is the magnitude of the magnetic field at the star, if the current in this long, straight wire is I=0.37A?



2. This circular loop of wire has a radius of 0.16m, and carries a current of 0.45A counter-clockwise (as seen from above). What is the magnetic field (magnitude and direction) at the star, a distance of 0.27m above the center of the circle?



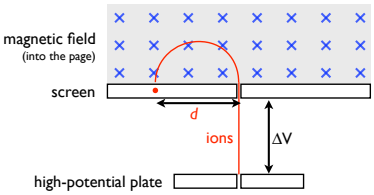
Physics 2140 Homework #11

5 problems

Complete by November 19

▷ **1.**

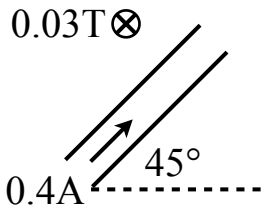
A *mass spectrometer* is a device that uses electric and magnetic fields to measure the mass of atomic ions (which are atoms that have more or fewer electrons than usual, and thus have a nonzero charge). An ion is accelerated through a potential difference ΔV, after which it is allowed to enter a uniform magnetic field B, as shown in the figure. The ion then travels in a semicircular path until it hits a phosphorescent screen, a distance d from its entry point. The screen glows when an ion hits it.



Suppose we ionize a lot of neon atoms—that is, we remove one electron from them, making them positively charged—and send them through the spectrometer. Two spots show up on the screen, one 4.08 m from the entry point, and one 4.28 m from the entry point. If the potential difference the ion is accelerated through is $\Delta V = 1000\,\text{V}$ and the magnetic field is 0.01 T, find the masses of the atoms that created these spots. (The spots are caused by different *isotopes* of neon; depending on the brightness of the spots, we can measure the proportions of these isotopes in our sample.)

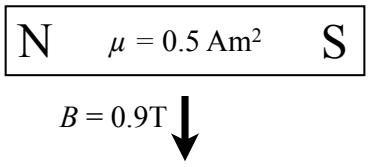
▷ **2.**

What is the force on 1 meter of a 0.4 A current that runs as shown, in a 0.03 T magnetic field that points into the page? Find the magnitude and describe the direction.



▷ **3.**

A bar magnet with dipole moment $\mu = 0.5\,\text{A}\cdot\text{m}^2$ is in a magnetic field of $\vec{B} = 0.9\,\text{T}$ downward, as shown. Find the torque $\vec{\tau}$ on the bar magnet.



▷ **4.**

Find the magnetic dipole moment $\vec{\mu}$ of a circle (radius 0.1 m) with a counterclockwise current 0.03 A.