WebAssign
CH21-HW02-FALL2010 (Homework)

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PHYS 272-FALL 2012, Fall 2012
Instructor: Virendra Saxena

Current Score : 26 / 26 **Due :** Friday, November 2 2012 11:59 PM EDT

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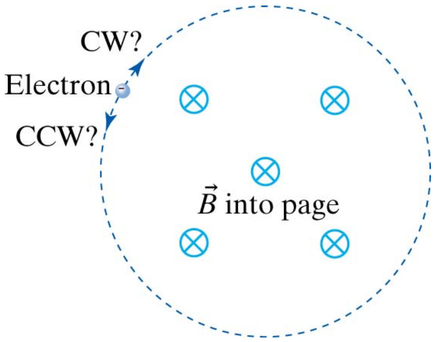
1. 1/1 points | Previous Answers MI3 21.1.X.003

In the figure there is a uniform magnetic field going into the page, produced by a large current-carrying coil (not shown). Would a moving electron go in a clockwise or counter-clockwise circle? (Hint: try both directions, and see which direction is consistent with the magnetic force.) Note that we're not asking what magnetic field is made by the moving electron, but what effect the coil's magnetic field has on the moving electron.

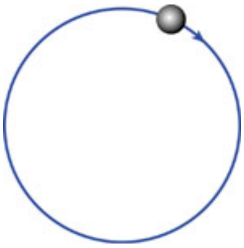
- (selected) Clockwise: $\vec{v} \times \vec{B}$ is outward, but the force is inward because the particle is negatively charged.
- Clockwise: $\vec{v} \times \vec{B}$ is inward, so the force is inward.
- Counterclockwise: $\vec{v} \times \vec{B}$ is outward, but the force is inward because the particle is negatively charged.
- Counterclockwise: $\vec{v} \times \vec{B}$ is inward, so the force is inward.



- *Read the eBook*
- Section 21.1

2. 4/4 points | Previous Answers MI3 21.1.X.035

An alpha particle (consisting of two protons and two neutrons) is moving in a circle at constant speed, perpendicular to a uniform magnetic field applied by some current-carrying coils. The alpha particle makes one clockwise revolution every 83 nanoseconds (see the figure).



If the speed is small compared to the speed of light, what is the numerical magnitude *B* of the magnetic field made by the coils? What is the direction of this magnetic field?

Proton Mass ≈ Neutron Mass ≈ 1.67e-27 kg

Proton Charge = +1.602e-19 C

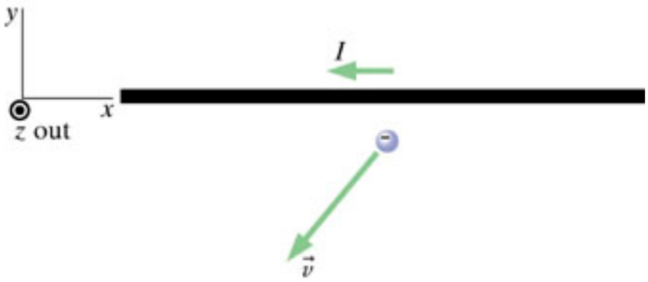
B = 1.578 T

- (•) out of the page
- ( ) into the page

- *Read the eBook*
- Section 21.1

3. 9/9 points | Previous Answers MI3 21.1.P.044

A long straight wire suspended in the air carries a conventional current of 5.5 amperes in the -x direction as shown (the wire runs along the x-axis). At a particular instant an electron at location < 0, -0.003, 0 > m has velocity < -2.5×10^5, -3×10^5, 0 >m/s.



(a) What is the magnetic field due to the wire at the location of the electron?

$\vec{B}$ = < 0 , 0 , 0.000367 > tesla

(b) What is the magnetic force on the electron due to the current in the wire?

$\vec{F}$ = < 1.7616e-17 , -1.468e-17 , 0 > N

(c) If the moving particle were a proton instead of an electron, what would the magnetic force on the proton be?

$\vec{F}$ = < -1.7616e-17 , 1.468e-17 , 0 > N

- *Read the eBook*
- Section 21.1

4. 3/3 points | Previous Answers MI3 21.2.X.047.alt01

A wire is oriented along the x-axis. It is connected to two batteries, and a conventional current of 1.5 A runs through the wire, in the +x direction. Along 0.23 m of the length of the wire there is a magnetic field of 0.6 tesla in the +y direction, due to a large magnet nearby. At other locations in the circuit, the magnetic field due to external sources is negligible.

What is the magnitude of the magnetic force on the wire?

$|\vec{F}_{mag}|$ = 0.207 N

What is the direction of the magnetic force on the wire

+z

- *Read the eBook*
- Section 21.2

5. 3/3 points | Previous Answers MI3 21.2.X.047

A current-carrying wire is oriented along the y-axis. It passes through a region 0.5 m long in which there is a magnetic field of 6.5 T in the +z direction. The wire experiences a force of 17.9 N in the -x direction.

What is the magnitude of the conventional current in the wire?

I = 5.508 A

What is the direction of the conventional current in the wire?

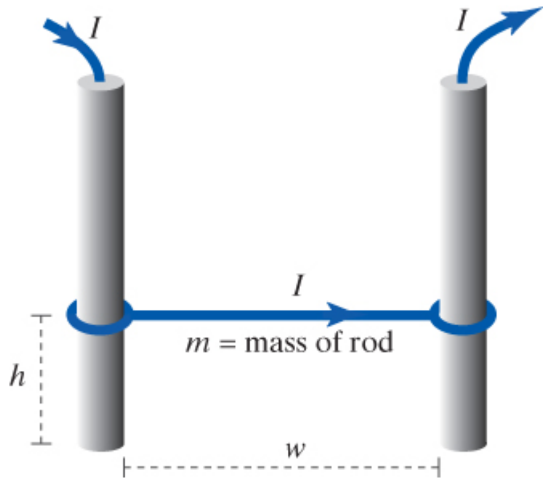
- (•) -y
- ( ) +y

- *Read the eBook*
- Section 21.2

6. 6/6 points | Previous Answers MI3 21.2.P.051

Magnetic levitation

A metal rod of length w = 19 cm and mass m = 70 grams has metal loops at both ends, which go around two metal poles (see the figure).



The rod is in good electrical contact with the poles but can slide freely up and down. The metal poles are connected by wires to a battery, and a current I = 6 amperes flows through the rod. A magnet supplies a large uniform magnetic field B in the region of the rod, large enough that you can neglect the magnetic fields due to the 6 ampere current. The large magnetic field is oriented to have the maximum effect.

The rod floats at rest h = 2 cm above the table. What is the magnetic field in the region of the rod? Assume $+x$ is to the right, $+y$ is up, and $+z$ is out of the page.

< 0 , 0 , -0.602 > T

Which of the following statements are true?

- [x] If the conventional current in the bar were less than 6 A, the bar would fall.
- [ ] If the conventional current in the bar flowed in the opposite direction (to the left), the bar would still float at rest 2 cm above the table.
- [x] The magnetic force on the bar is in the +y direction (upward).

- *Read the eBook*
- Section 21.2