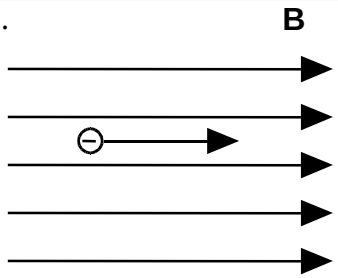
Magnetism: Worksheet 2

Part 1 - Magnetic Force Direction

The following diagrams show a charged particle or a current carrying wire in a magnetic field. For each diagram use the right-hand rule to draw an arrow on the object that shows the direction of the magnetic force. Remember the angry Physics Gnomes! (A ⊗ means the direction is into the page and a • means the direction is out of the page towards you.)

1.



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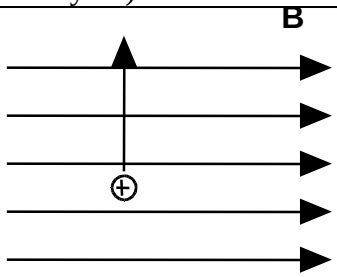

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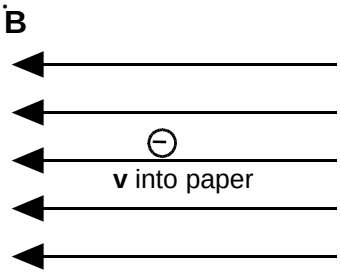

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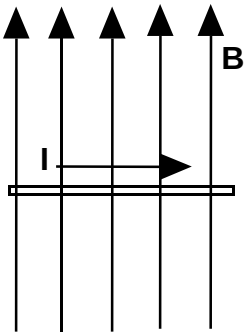

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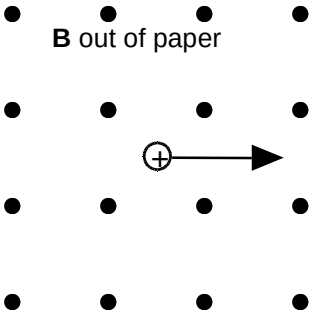

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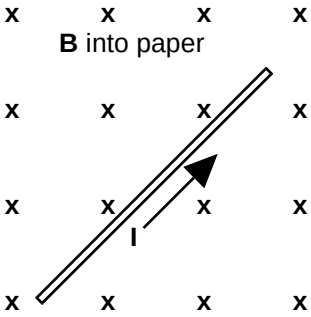

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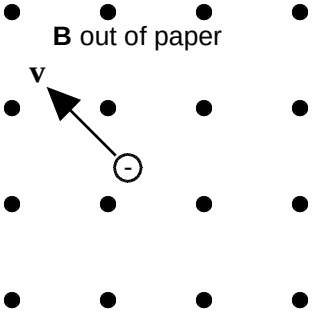

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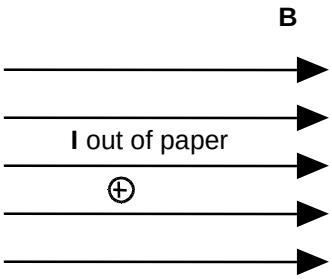
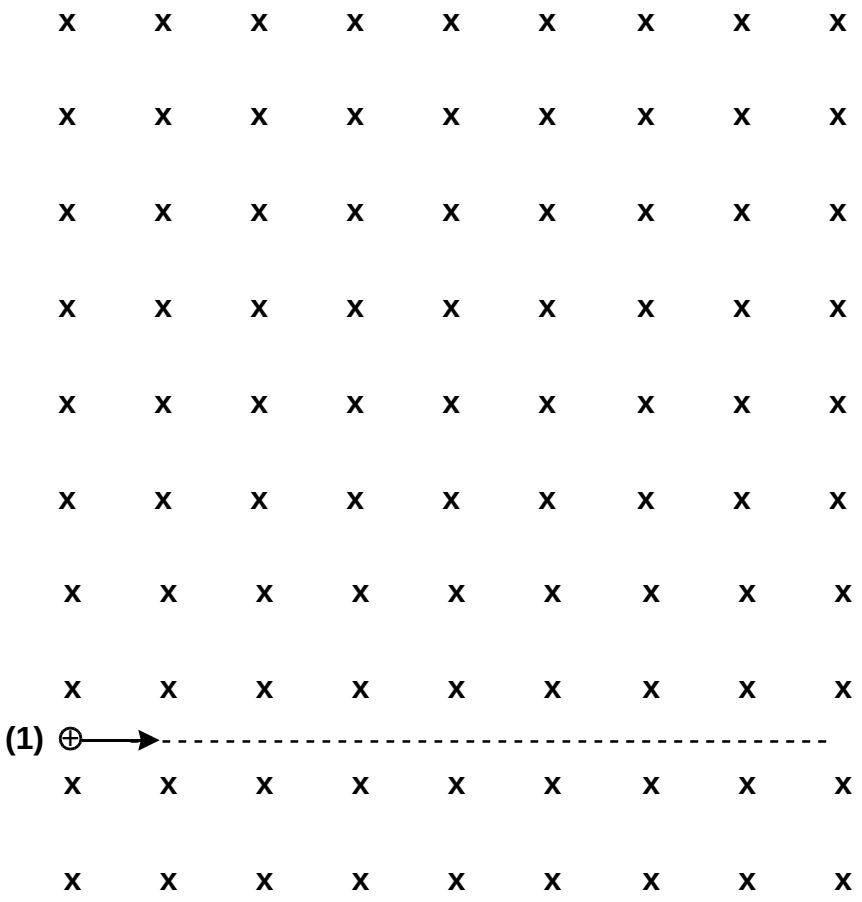


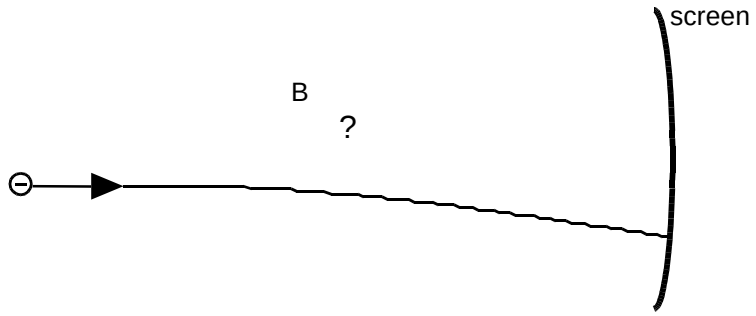
Part 2 - The Path of a Charged Particle in a Magnetic Field

A proton moving horizontally at speed **v** enters a uniform magnetic field. Determine the direction of the magnetic force on the proton and represent it as a vector originating on the proton. Place a dot a couple of centimeters beyond the original position where you think the proton will be relative to the dashed line. Label this position (2). Estimate the direction of the velocity of the particle at position (2), then draw the vector representing the magnetic force acting on the proton. Continue this process until you can decide the general shape of the path taken by the proton.

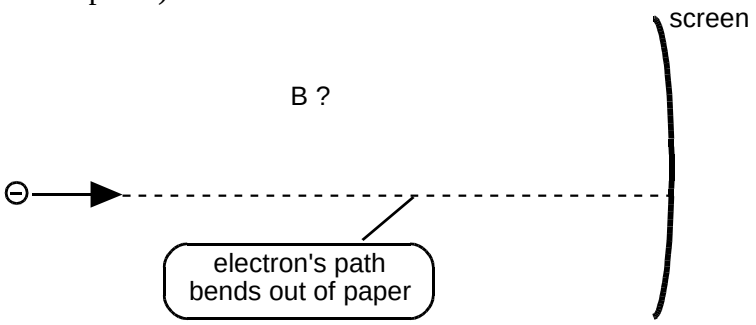


9. Does the speed of the proton change as it moves along its path? Explain.

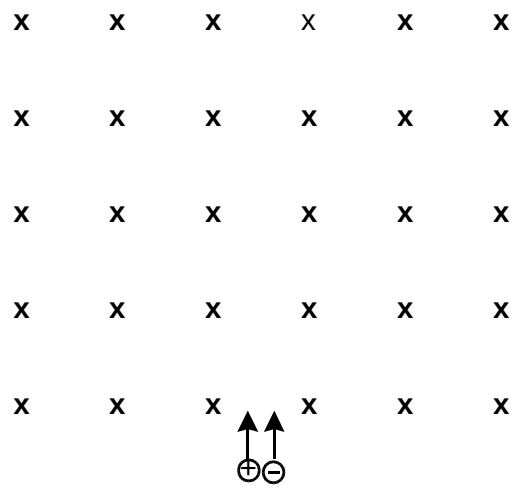
10. A cathode sends a stream of electrons towards the screen of a television picture tube. In what direction should a magnetic field point to deflect the electron's path downward?



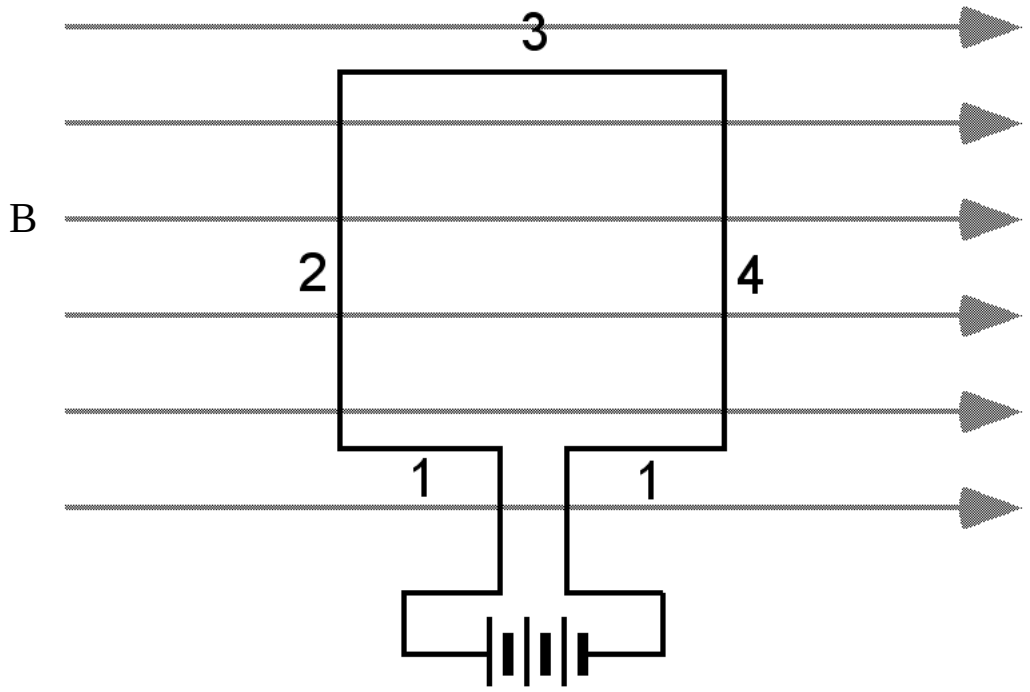
11. In what direction should a magnetic field point to deflect the electron's path out of the paper (it stays in a horizontal plane)?



12. A negatively-charged electron and its antiparticle, a positively-charged positron, are shot at different times into a magnetic field directed into the paper. Sketch the path you would expect each particle to take as it moves through the magnetic field.



13. A rigid wire loop is placed in a uniform magnetic field as shown below. Determine the direction of the current in each segment of the loop, then the direction of the force on each segment.



A) Direction of magnetic force on segment 1
a) to the left b) to the right c) out of plane of page d) into plane of page e) none

B) Direction of magnetic force on segment 2
a) to the left b) to the right c) out of plane of page d) into plane of page e) none

C) Direction of magnetic force on segment 3
a) to the left b) to the right c) out of plane of page d) into plane of page e) none

D) Direction of magnetic force on segment 4
a) to the left b) to the right c) out of plane of page d) into plane of page e) none

E) Will the loop tend to rotate? If so, in which direction? Explain.

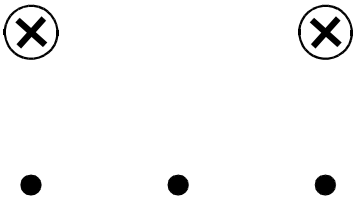
Magnetism: Worksheet 3

1. A straight wire 50 cm long conducts a 6.0 A current directed up out of the page. If the wire experiences a force of 0.24 N to the right due to a magnetic field perpendicular to its length, what is the magnitude and direction of the magnetic field?

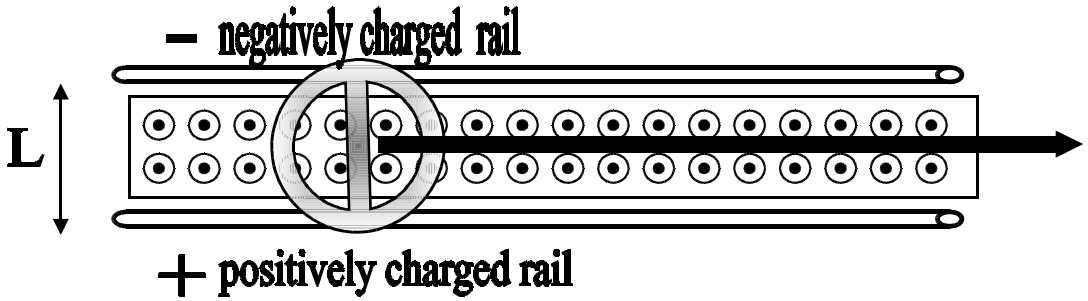
2. A horizontal magnetic field of 2.0×10^{-3} T forms a 30˚ angle with a 0.75 m length of wire carrying a 15.0 A current. What is the force acting on the wire?

3. A proton from a particle accelerator enters a uniform magnetic field of 0.080 T oriented perpendicular to its path and follows a circular path with radius of 2.0 m. What is its velocity? Sketch a diagram.

4. Below are two current carrying wires. Both are carrying current into the paper. Draw a vector indicating the direction of the magnetic field at the 3 points below the wires.



5. A titanium alloy disc (0.010 kg) and rails are shown viewed from the top. A magnetic field of 2.0 T is coming out of the page. The distance between the rails is L = 0.02 meters. A current of 120 amps runs through the disc.



a. What is the force on the disc?

b. How long must the track be to obtain a final velocity of 20 m/s?