

Lab: Drawing Magnetic Fields

AP Physics

Background

Magnetic fields are easily visualized by sprinkling “iron filings” in the vicinity of the field: the long filing line up along field lines, giving a beautiful visual model of the invisible magnetic field. In the absence of iron filings, a compass may be used as a “magnetic field tester” by placing at different locations where one wants to identify the direction of the magnetic field.

Objectives

To create magnetic field sketches for a series of different situations.

Equipment

Bar magnets, horseshoe magnet, compass, current-carrying wire, current-carrying solenoid, iron filings, clear acetate sheet

Procedure

1. Arrange magnets as shown in each scenario.
2. If possible, place the acetate sheet over the magnets to protect them from coming into direct contact with the iron filings.
3. Slowly and carefully sprinkle iron filings onto the acetate sheet in the vicinity of the magnets underneath. Continue sprinkling until a clear image of the magnetic fields is revealed.
4. Use the compass to determine the North-South orientation of the magnetic field lines.
5. Sketch the magnetic field lines for the given scenario. Note that:
 1. Opposite magnetic poles attract, like poles repel.
 2. A magnetic field line is tangent to the magnetic field at any given point. The magnetic field points in the same direction that the north arrow of a compass needle would point if placed at that location.
 3. The number of field lines in an area is proportional to the field strength in that area.
 4. Magnetic field lines form closed loops, with the magnetic field in the interior of a bar magnet pointing in the same direction as the magnet itself.
6. Once you’ve completed the sketch for one scenario, carefully lift the acetate off the magnets, pour the iron filings back into the cup, and proceed to the next scenario.

The Scenarios

1.



3.



2.



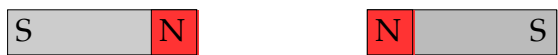
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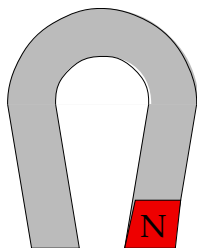
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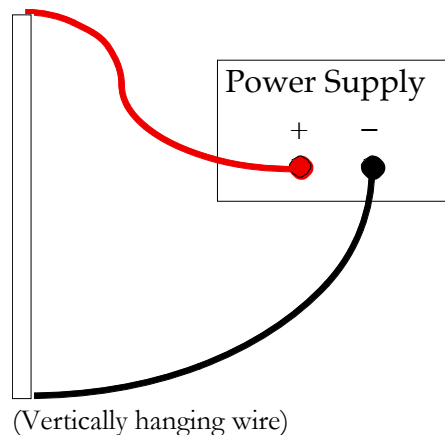
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6.

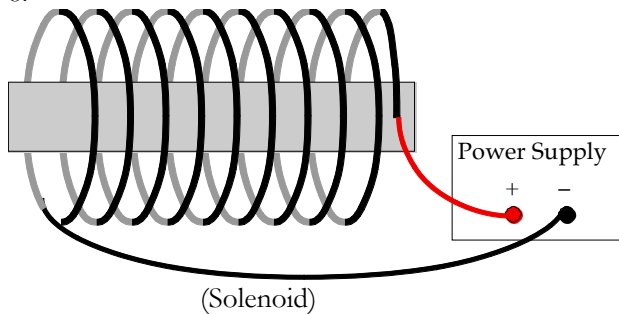


7.



Indicate both the direction of current in the vertical wire, and the magnetic field in the vicinity of that wire. (Note: If the power supply is left on for very long, the circuit breaker will shut off power supply.)

8.



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