

PHYS Faraday PhET Sim Lab

Ch. 24 - 25

Name _____

Date _____ Hour _____

Getting Started: Open the PhET Simulation called Faraday’s Electromagnetic Lab. (If doing this from home, you will need to go here and play the simulation online:

http://phet.colorado.edu/simulations/sims.php?sim=Faradays_Electromagnetic_Lab

Procedures:

A. Bar Magnet

1. Here you will find a compass and a bar magnet. What do the two have in common?

2. Slowly move the compass around the bar magnet. What observations do you make? How can you explain what you are witnessing?

3. Increase and decrease the strength of the bar magnet (use slider) and continue to slowly move the compass around the bar magnet. What effect does changing the magnet’s field strength appear to have on the compass?

4. Place the compass next to the South Pole of the bar magnet and press the Flip Polarity button. What happens to the magnet and the compass?

5. Click See Inside Magnet. What do you see?

6. Click Show Field Meter and move the meter around. In what position does \vec{B} have the greatest magnitude? When does it get weaker?

7. Where is B_x positive? _____ Where is it negative? _____

Where is B_y positive? _____ Where is it negative? _____

8. Place the meter at a location to the left and underneath the bar magnet. What are the B_x , B_y and B values? Verify the mathematical relationship between the three.

B. Pickup Coil

1. Here you have a bar magnet and a coil of wire attached to an incandescent light bulb. Does the coil or the bar magnet appear to be creating the magnetic field? How can you verify this?

2. Click the Show Electrons box off and back on. What does it do, visually?

3. Move the bar magnet around the **outside** of the coil/bulb apparatus. What do you observe happening to the coil/bulb?

4. What could possibly explain WHY this is occurring?

5. Now, move the bar magnet back and forth inside the coil of wire. Thoroughly describe and explain your observations.

6. Increase and decrease the strength of the bar magnet (slider) and repeat. What effect does changing the magnet's strength have?

7. Set the bar magnet strength at 75% and continue to move the magnet. Decrease the number of loops to 1, and then increase it to 3. What effect does this have?

8. Replace the incandescent bulb with the Voltage meter and return loop # to 3. What happens when you move the bar magnet back-n-forth through the loop?

Does this appear to be creating a Direct Current or an Alternating Current? How do you know?

9. What effect does changing the bar magnet strength or the number of loops seem to have on the voltage? What combination gives you the greatest voltage?

C. Electromagnet

1. Here you will find a compass and a power supply (battery) connected to a coil of wire. What effect does the battery appear to be having on the wire?

2. How can you confirm that the battery is, indeed, a DC power supply...and not just trust the label by the picture?

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3. What appears to be creating the magnetic field being represented here?

How can moving the compass around confirm that?

Why do you suppose the magnetic field surrounding the compass is not being represented by the simulation in this instance?

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4. Does changing the number of loops appear to have an effect on the rate of motion of the electrons in the wire? Explain.

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5. Gradually decrease the voltage of the battery from 10 V to 5 V. What effects does that appear to have on things?

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6. What happens when the voltage is 0 V?

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7. You may have noticed that you can continue to slide the voltage bar to the left. What does that do? Explain. (Slide bar back-n-forth a couple times to confirm).

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8. Press the Show Field Meter button. Set the voltage to 10 V. What is the strength of the magnetic field inside the coil?

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9. Decrease the voltage to 5 V. What effect did that have on the field strength? What kind of relationship do the two appear to have?

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10. Replace the battery with an AC Current Supply. What effect does this have on the wire, the compass and the magnetic field meter?
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D. Generator (Note: This is the FIFTH Tab)

1. Here you will find a water faucet, a compass, a bar magnet on a wheel (turbine), and a coil of wire connected to an incandescent bulb. Move the compass around a little and determine what it is reacting to at this time.

2. Turn the faucet on, just enough to get about 10 RPM on the turbine. What effect does this have on the compass and the wire/bulb?

3. Increase the rotation to about 20, 50, even 100 RPM. What effect does that appear to have on the compass, the wire and the bulb?

4. Increase and decrease the number of loops. What effect does this have?

5. Increase and decrease the bar magnet's strength. What effect does this have?

6. Replace the bulb with a Voltage Meter. What effect does increasing the RPMs have on the amount of voltage?

7. Does the rotating magnet appear to create a Direct or Alternating Current? Explain.

8. What effect does the number of loops appear to have on the voltage?

9. The moving of this magnet has created an electric current in the coil, which is being utilized by the bulb! Do you know what we call such a device? What is it?

10. If we could reverse this process, what would we call the device? What would we have to do to make that work? Can you get the simulation to do it?
