

Phet Exploration: Magnets, Transformers, and Generators

Go to Phet simulations, Electricity, Magnets, and Circuits section, and run the “Generator” applet.

1. Bar Magnet

- a) Move the compass around the bar magnet. How does the position of the compass needle compare to the magnetic field? What happens when you flip the polarity of the magnet?

Challenge: Use the field meter, and make a table showing magnetic field strength (“B”, measured in “Gauss”) vs. distance from the end of the magnet. (There are no units given for position, so just use arbitrary units of “one compass away”, “two compasses away”, etc. Alternatively, you can tape a ruler to the screen.). Describe the shape of the graph, and the relationship between field strength and distance.)

2. Pickup Coil

- a) Set the bar magnet strength to 100%. Move the bar magnet through the coil, and describe what happens.
- b) Change the pickup coil indicator from light bulb to meter, and describe which one gives more information.
- c) Does it make a difference whether you move the coil by the magnet, or the magnet by the coil?
- d) Try to get the greatest amount of light out of the light bulb. How much of the screen can you fill with light rays? (The spread of the rays represents the brightness of the bulb.) What combination of variable settings gave the greatest amount of light?

3. Electromagnet

- a) Look at the field around a DC electromagnet. Compare it to the field from the bar magnet in part 1.
- b) What happens to the field if you use an AC voltage source (like from an outlet in your house) instead of a DC battery?
- c) What happens to the field if you use fewer loops of wire? (You can use the field meter to get quantitative measurements for this.)

4. Transformer

- a) Adjust positions and variables to try to get the light bulb to light up. What combination made the light brightest?
- b) **** IMPORTANT**** Why doesn’t the transformer work the same way when you use a DC battery? Hint: Go back to part 2, with the Pickup Coil, and describe what created a voltage in the coil.
- c) Can you still get the light to work somehow if you use a battery?

5. Generator

- a) Turn on the water to get the generator to work. What combination of variable settings gives the greatest amount of light?

Assignment: Using knowledge and observations from all 5 sections, write a summary of how the generator works, step by step. (You can type this or write it by hand.) Use complete sentences with proper grammar and spelling. It may help to make a diagram of the generator. You should use terms such as electrons, current, AC and DC, magnetic field, varying, loops, speed, and area.