

**DO NOT WRITE ON, CLASS COPY.
TURN IN YOUR ANSWERS ON YOUR OWN PAPER.**

Physics

Lab - Electromagnetic Generation - pHet Simulation

SIMULATION

1. Open phet.colorado.edu , play with sims, **Physics, Electricity Magnets and Circuits** then **Faraday's Electromagnetic lab** then **RUN NOW**

Part A Bar Magnet This is like the lab you did. You can move the magnet or the compass

Click on **flip polarity** and then sketch the field at the right . USE ARROWS to show direction



PART B Pickup Coil At the top click on **Pickup Coil**

1. Move the magnet back and forth and then place it exactly inside the coil

2. Does the lamp light when the magnet is not moving? _____

3. In the **pickup coil** section at the right

click on the **meter** (right of the bulb). It reads (current) (voltage)

4. Check the poles of the magnet . The N pole should be on the right side of the magnet.

In the **Bar Magnet** box change **strength** to **100%**

STARTING FROM FAR LEFT Move the magnet through the coil fairly fast.

Moving TOWARDS the coil the voltage is mostly (positive) (negative)

Moving AWAY FROM the coil to the right the voltage is mostly (positive) (negative)

5. At the right **bar magnet** click on **polarity** . The _____ is NOW on the right.

Repeat step 4. The voltages are (the same) (reversed)

6. Change the number of loops to **1** , then **2** , then **3** Each time move the magnet quickly into the coil

7. Describe the differences between 1 loop and 3 loops _____

8. Try moving the magnet at different speeds - describe what happens for each

very slowly _____

rapidly _____

9. Which steps above showed this ? _____

PART C Electromagnet At the top click on **Electromagnet**

1. A coil of wire connected to a battery is making a _____

2. Click on **show Field Meter**. Change the **battery voltage** and **number of loops in the coil** to complete the table

3. Reducing the voltage (increases) (decreases) the field

4. Increasing the number of loops _____

Batt Voltage	Loops	B Mag Field
10	4	
6	4	
2	4	
10	3	
10	2	

PART D Transformer At the top click on **Transformer**

In this simulation one coil is making a magnetic field (PRIMARY) and the other is picking it up (SECONDARY)

1. At the start is current flowing in the battery coil ? _____ Is the lamp lit ? _____
2. Now move the battery coil back and forth as in part B above. Does the light go on and off? _____
3. At the top right click on **AC** to replace the battery with an AC voltage. KEEP IT STILL!
- a) Describe what is happening to the magnetic field _____
- b) What is happening to the light? _____
4. This works because a _____ magnetic field (AC) INDUCES a changing current

5. Now replace the bulb with a **meter**

6. Investigate the AC voltage controls

a) Adjust the **left slider** ONLY

This controls the PEAK VOLTAGE
 Sketch screen display for 30% , 100 %
 Return to 50%

b) Adjust the **bottom slider** ONLY

This controls the frequency
 = No of waves per second
 Sketch screen display for 30% , 100 %

Peak Voltage 30 %	Peak Voltage 100 %
Frequency 30%	Frequency 100 %

7. Change the pick up coil loops to get maximum voltage.

No. of coils = _____ Change loop area for maximum voltage **loop area** = _____%

8. Move the power coil so that the blue border of the power supply just touches the blue border of the meter. KEEP THIS POSITION

9. Find the maximum (pos or neg.) voltage as you change the controls on the AC power supply. Record data in table

Voltage	Frequency	Peak Voltage
50	50	
100	50	
100	100	

10. Explain how your data shows Faraday's Law. _____

PART E Generator At the top click on **Generator**

Electric power generation using water - hydroelectric power

1. Try changing the water faucet control

Describe what happens _____

2. Change the magnet strength, and coil loops and area to maximum

3. Change the bulb to a meter

4. Record maximum voltage at 3 different water settings

5. Explain this effect in terms of Faraday's Law _____

Magnet spin	Peak Voltage
20 RPM	
60 RPM	
100 RPM	