

Lab 36-2: Magnetic Induction

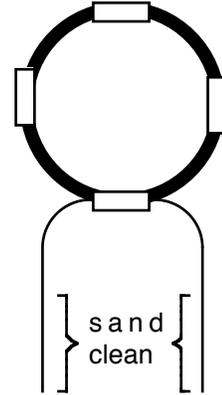
- Purpose:**
- To explore the magnetic field created by a coil of wire.
 - To explore how a coil of wire interacts with magnetic fields.
 - To make a simple speaker and explain how a speaker works.

- Materials:**
- | | |
|----------------|---|
| 2 coils | 2 mini-stereo to alligator leads |
| 1 ring magnets | 2 wires & alligator clips |
| 1 mini-amp | 1 iPod 1 mini-stereo to mini-stereo cable |

Procedure:

Part 1: Make 2 Coils

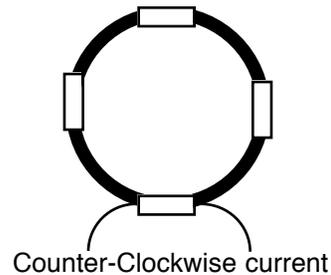
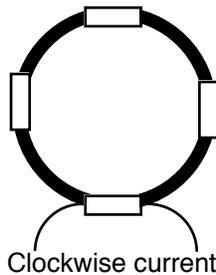
- Tightly wrap a strip of wire around the piece of PVC tube. Leave the ends of the wire free.
- Carefully remove the coiled wire from the PVC, and then use 4 little pieces of tape to tightly tape up 4 sides of the coil.
- Using sandpaper, clean off the ends of the wires so that there is a about 1/2 inch of clean bare wire. The coil should look like the picture to the right.
- Repeat the above steps to make a second identical coil.



Part 2: The Magnetic Field created by a coil (DC)

- Attach one of the coils to the power supply with 2 wires and alligator clips.
- BRIEFLY turn up the power. Does the coil do anything? (It will get hot – so briefly means less than a second.)
- Put the magnet under the coil. BRIEFLY turn up the power. What happens?
- Flip the magnet over, and put it back under the coil. (Remember that one side of the magnet is a north pole and the other side is a south pole.) BRIEFLY turn up the power. What happens?
- Explain what was happening:

- Draw the resulting magnetic field in the middle of each coil for the two situations shown:



Part 3: The Magnetic Field created by a coil (AC)

- Attach one of the coils to the AC side of the power supply with 2 wires and alligator clips. (The AC side is the yellow plugs.)
- BRIEFLY turn up the power. Does the coil do anything? (It will get hot – so briefly means less than a second.)
- Put the magnet under the coil. BRIEFLY turn up the power. What happens?

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4. Flip the magnet over, and put it back under the coil. (Remember that one side of the magnet is a north pole and the other side is a south pole.) BRIEFLY turn up the power. What happens?
5. How does the amplitude and the frequency of the vibrations depend on the voltage?
6. Explain what was happening:

Part 4: Magnetic Induction in the second coil

1. Connect the second coil to the mini-amp using the stereo-to-alligator cable. Turn on the mini-amp and turn it all the way up.
2. Lightly tap the coil on the table. What happens?
3. Lightly tap the coil on the magnet. What happens?
4. Place the coil on the magnet. What happens?
5. Move the coil back and forth across the magnet. What happens?
6. What must be happening for there to be a “click” or a noise coming from the mini-amp?

7. With the original coil still plugged into the AC, turn on the power VERY LOW. (Just rotate the power knob a little bit – you probably won’t even notice a current reading.) Now place the second coil on top of the first. What happens?
8. What happens to the sound as you increase or decrease the power? What happens to the sound as you move the coils around?

9. Repeat the above, but with the first coil plugged into the DC side of the power supply. Explain what happens and why it is different from the AC side.

10. Disconnect the coil that is connected to the power supply and instead connect it to an iPod using the other stereo-to-alligator cable. (Now one coil should be connected to the mini-amp and the other to the iPod.) Play a song on the iPod and move the coils close together. What happens?

Part 5: Speakers

1. Disconnect both coils. Connect the iPod to the mini-amp using the stereo-to-stereo cable. Then connect one of the coils to the “EXT SPKR” of the mini-amp.
2. Turn on the iPod and the mini-amp. (Both at least 1/2 power.)
3. Take the coil and press it to your head next your ear using the magnet. What happens?
4. Press the coil onto the end of a cup with the magnet. Try a few different cups. What happens?
5. Explain.