

Activity Instructions

Part I - Speaker Construction

The following items will be needed for this part of the activity:

per group:

- enamelled copper wire (28-34 gauge)
- cardboard tube
- glue stick
- Styrofoam plate
- business cards
- strong cardboard (4 in. x 6 in. sheet)
- NIB (neodymium) or other rare earth magnet
- tape

per class:

- permanent marker
- craft knife
- lighter
- hot glue gun and hot glue sticks

Step 1

Make a mark on the wire 15 cm from one end with a permanent marker. At this mark, tape the wire to the cardboard tube 1 cm from the edge (**Figure 1**). Leave the 15 cm end free; this is one of the two leads that will eventually be attached to the amplifier.



Figure 1

Step 2

Using the long end, wind the copper wire neatly around the tube, without overlapping. When the coil covers 2.5 cm of the tube, place one piece of tape over the coil along the length of the tube to secure the coil (**Figure 2**). If the coil is loose or the wires are overlapped, the sound quality will be drastically reduced. Cut the leftover wire, leaving a 15 cm tail; this is the other lead that will be attached to the amplifier. If there is not enough wire left over to leave a 15 cm tail, unwind one or two turns of the coil.



Figure 2

Styrofoam Plate Speaker - Activity Instructions

Step 3

Cut the tube with the craft knife so that there is 1 cm of cardboard exposed on both sides of the coil (**Figure 4**).



Figure 4

Step 4

Using the lighter, melt off 2 cm of the coating from both free ends of the wire so that electrical contact can be made with the amplifier output port (**Figure 5**).



Figure 5

Step 5

Secure the tube to the centre of the bottom of the Styrofoam plate using a glue gun (**Figure 6**).

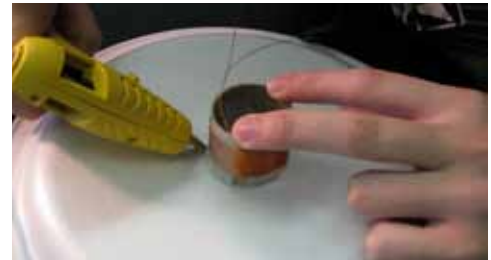


Figure 6

Step 6

Fold the business cards into four equal sections, as shown in **figure 7**. These will act as springs. Glue the springs to the plate on either side of the tube (**Figure 8**). When the spring is relaxed, it should be longer than the permanent magnet. If this is not the case, use two business cards to make one spring. Be aware that using too many business cards will make a floppy spring.

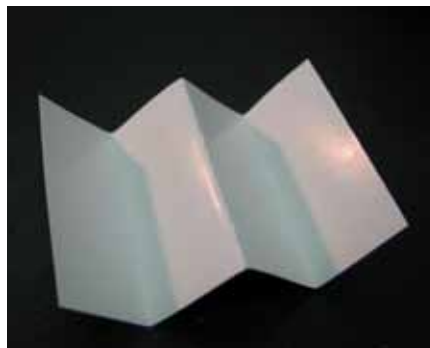


Figure 7

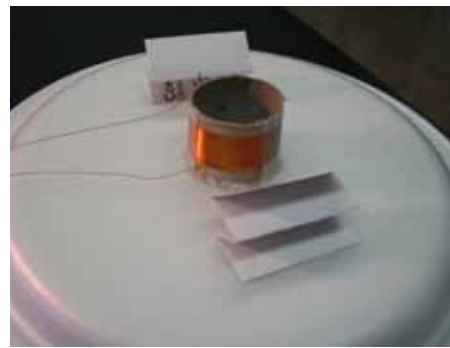


Figure 8

Styrofoam Plate Speaker - Activity Instructions

Step 7

Glue the magnet to the centre of the cardboard base (the 4 in. by 6 in. sheet of cardboard). Place the cardboard tube containing the coil over the magnet. Ensure that the plate does not touch the top of the magnet. If it does, then the springs are not long enough or they are too floppy. Glue the free ends of the business card springs to the base on either side of the magnet (**Figure 9**). If reusing the same magnet for several speakers, the ends of the business cards can be taped so that the speaker can easily be removed from the base.

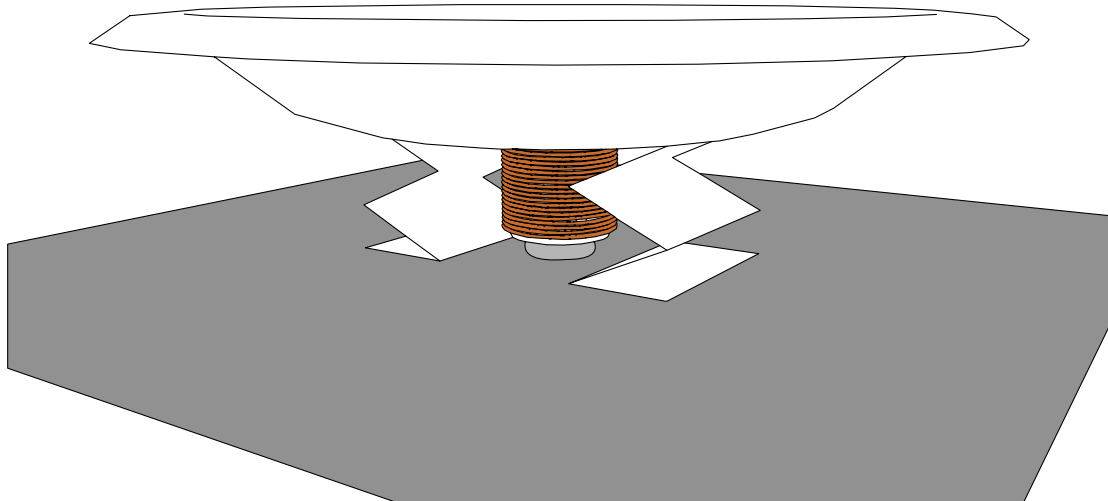


Figure 9

Styrofoam Plate Speaker - Activity Instructions

Part II - Connecting the Speakers to an Amplifier

The following items will be needed for this part of the activity:

per class:

- home studio amplifier
- audio source (MP3 player or computer)
- 3.5 mm to RCA stereo audio male-to-male cable
- alligator clip wires

Step 1

One end of the amplification system's input cable will be a 3.5 mm TRS plug; this is the standard plug on headphones and microphones. Connect this end to the audio output port of a computer or MP3 player (**Figure 10**). Depending on the amplifier, the other end of the cable can be another 3.5 mm TRS connector, a pair of RCA connectors, exposed leads or some other kind of connector. Connect this end to the audio input port on the amplifier (**Figure 11**).



Figure 10

Step 2

Take two alligator clip wires and connect one to each wire of the coil (**Figure 12**).



Figure 11

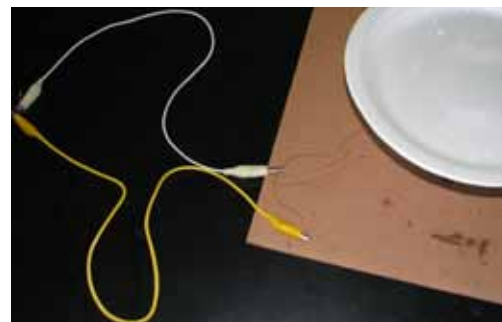


Figure 12

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Step 3

Take the other end of each of the two alligator clips and connect them to the output pins of the amplifier (**Figure 13**). Typically, these output pins are exposed electrical contacts in the form of screws. They often come in pairs, with one pin labelled "ground" or "GND". Each pair of pins represents a channel that outputs voltage to one speaker.



Figure 13



Figure 14

Step 4

Plug in and turn on the amplifier. The speakers are now ready to use (**Figure 14**).