Materials needed:
- 1 Gikfun speaker kit
- Soldering iron + solder
- Fan
- Brass sponge (or sponge)
- Wire strippers
- Heat shrink
- Precision screwdriver

Safety:
- Never solder a live circuit (one that is energized or connected to a power source).
- Turn on the fan for soldering.
- Always put the soldering iron back in its stand when not in use. Never place a hot soldering iron on your work surface—you could start a fire!
- Give any soldered surface a few minutes to cool down before you touch it.
- Turn off the soldering iron and fan when you are not using it.

Overview:

The goal of this project is to use proper knowledge of circuit elements and lab techniques to put together a speaker set with enclosure. We will start by making sure we have and are familiar with all the materials involved. Then we will solder ICs and passive components to the PCB (resistors, capacitors, diodes, etc). Then we will strip the wires and solder them to their appropriate locations on the PCB. Finally, we will be the construction of the box which involves peeling the plastic off the enclosure faces and screwing the edges and corners together to have everything contained in your final product speaker.
### Materials:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaker Enclosure Faces</td>
<td>12</td>
<td>plastic, jigsaw puzzle type box faces to house circuitry of the speakers, 6 for each speaker</td>
<td><img src="image1.png" alt="Speaker Enclosure Faces" /></td>
</tr>
<tr>
<td>Circuit Board</td>
<td>2</td>
<td>PCB board to connect ICs, capacitors, resistors, and diodes (back of boards shown)</td>
<td><img src="image2.png" alt="Circuit Board" /></td>
</tr>
<tr>
<td>Speaker Driver</td>
<td>2</td>
<td>Cone, electromagnet, and frame of speaker driver</td>
<td><img src="image3.png" alt="Speaker Driver" /></td>
</tr>
<tr>
<td>USB Cord</td>
<td>1</td>
<td>Power cable for speakers</td>
<td><img src="image4.png" alt="USB Cord" /></td>
</tr>
<tr>
<td>Double Intertwined Wires</td>
<td>1</td>
<td>red and black double wire</td>
<td><img src="image5.png" alt="Double Intertwined Wires" /></td>
</tr>
<tr>
<td>Three-core wire</td>
<td>1</td>
<td>triple layer insulation wire</td>
<td><img src="image6.png" alt="Three-core wire" /></td>
</tr>
<tr>
<td>Four-core wire</td>
<td>1</td>
<td>quad layer insulation wire</td>
<td><img src="image7.png" alt="Four-core wire" /></td>
</tr>
<tr>
<td>Bag of nuts and screws</td>
<td>1</td>
<td>fasteners for the speaker enclosure faces</td>
<td><img src="image8.png" alt="Bag of nuts and screws" /></td>
</tr>
<tr>
<td>Bag of passive elements and ICs</td>
<td>2</td>
<td>resistors, capacitors, LEDs, and other chips</td>
<td><img src="image9.png" alt="Bag of passive elements and ICs" /></td>
</tr>
</tbody>
</table>
Procedure:

1. **Solder the IC to the circuit board.**
   - Attach the power IC (8 leads long) to the front of the bread board. Line up the angled side of the IC with the angled side of the diagram.

2. **Solder the resistors to the circuit board and snip off the excess leads.**
   - R1 – 22K
   - R2 – 10K
   - R3 – 330
   - R4 – 10K

3. **Solder the capacitors to the circuit board and snip off the excess leads.** Make sure to align the shorter lead (negative) with the shaded portion. Check capacitance values to make sure each capacitor is in the correct location.
   - C1 – 470uF
   - C2 – 10uF
   - C3 – 1uF
   - C4 – 1uF
   - C5 – 1uF
   - C6 – 10uF

4. **Attach the volume potentiometer (labeled 503) and solder to RP1.** Turn knob all the way to the right to increase the volume level.

5. **Attach the music level potentiometer (labeled 103) and solder to RP2.** Turn knob all the way to the right.

6. **Attach the LEDs matching D1, D2, D3 to the greens, D4 to the yellow, and D5 to the red while noting the polarity of the LEDs.**

7. **Repeat steps 2-6 for the second circuit board.**

8. **Cut the double intertwined wires in half and peel apart (can peel just the ends).**
9. Take one pair of the wires and strip the ends. Solder one end of the red wire to the positive node of the speaker and other end of the red wire to the hole on the circuit board labeled “V_{o+}.” Solder one end of the black wire to the negative node on the speaker and the other end to the hole on the circuit board labeled “V_{o-}.” Repeat with the other half of the wires for the second speaker and bread board.

10. Take the three-core wire and strip the ends, including the individual wires. Detach the shell of the AUX cable and solder the black wire to the bottom hole of the AUX connector, the red one to the right hole, and the yellow one to the left hole of the AUX connector.

11. Cut off the DC plug of the USB cable and strip the two wires. Take one end of the four-core wire and strip the outer layer as well as each individual wire.

12. Attach the black (white) wire of the USB cord to the black wire of four-core wire and solder them into the bread board hole labeled “GND.” Attach the red wire of the USB cord to the red wire of the four-core wire and solder them into the breadboard hole labeled “+5V.”

13. Take the other end of the three-core wire (the end not attached to the AUX connector). Attach the yellow wire of the three-core wire to the yellow wire of the four-core wire and solder them onto the same bread board to the unlabeled hole. Attach the black wire of three-core wire to the green wire of the four-core wire and solder them into the bread board hole labeled “IN-.” Solder the remaining red wire from the three-core wire into the breadboard hole labeled “IN+.”
14. Strip the wires from the other end of the four-core wire and solder them into the second bread board. The green wire goes to “IN-,” the yellow wire goes to “IN+,” the black wire goes to “GND,” and the red wire goes to “+5V.”
15. Use multi-meter to check connections.
16. Peel off the stickers for all the plastic box enclosure faces.
17. Use the larger screws and nuts to attach the speakers to the enclosure faces with the large hole.
18. Attach the gold screws/nuts and large nuts to attach the breadboards.
19. Use the large screws to attach the enclosure face with four centered holes to the gold screws/nuts of the breadboard. Beware of the edge with the larger indent—that should align with the wires coming out of the breadboard.
20. Use the small screws and nuts to attach the remaining faces and complete the speaker boxes.
21. Attach USB to power source and connect AUX cable to a source of sound to test if speaker system works.
22. Congratulations! You are done!