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**Materials:**

- Magnetic Wire

- 1mm Copper Cable

- 1/2 inch PVC Tube

- 1 Transistor

- 10.5 Switch

- 22k resistance

- Snap for 9-volt battery

- Aluminum

- Welding

- 9-volt battery

- 1 lightbulb

- Thermofit

- Piece of wood for models

- Soldery iron

- Cutting pliers

- Spray paints

**Procedure:**

1. Gather all the materials
2. Cut the pvc tube
3. Wind the magnetic cable around the tube
4. Solder the resistance to the transistor
5. Weld one end of the bovine to the transistor
6. Solder the half-millimeter cable to one end of the transistor
7. Weld with resistance
8. Solder the 9-volt battery clip to one end of the transistor
9. Solder the clasp to the switch
10. Paint the wooden board
11. Connect the battery and test with a bulb

**Explanation:**

Nikola Tesla is the creator of the Tesla Coil, and the principles behind this invention are very simple. Looking back at our previous lessons, electrical current is the flow of electrons, while the difference in electric potential (voltage) between two places is what pushes that current. Current is like water, and voltage is like a hill. A large voltage is a steep hill, down which a stream of electrons will flow. A small voltage is like a near-flat plain with almost no water flow.

The power of the Tesla coil lies in a process called ***electromagnetic induction***, i.e., a changing magnetic field creates an electric potential that compels current to flow. Conversely, flowing electric current generates a magnetic field. When electricity flows through a wound-up coil of wire, it generates a magnetic field that fills the area around the coil in a particular pattern. Similarly, if a magnetic field flows through the center of a coiled wire, a voltage is generated in the wire, which causes an electrical current to flow.

The electric potential generated in a coil of wire by a magnetic field through its center increases with the number of turns of wire. A changing magnetic field within a coil of 50 turns will generate ten times the voltage of a coil of just five turns. (However, less current can actually flow through the higher potential, to conserve energy.)

“Tesla coils employ a pre-made high voltage iron core transformer to go from 120 V wall current to roughly 10,000 V. The wire with 10,000 volts is wrapped into one very large (primary) coil with only a handful of turns. The secondary coil contains thousands of turns of thin wire. This, steps up the voltage to between 100,000 and one million volts. This potential is so strong that the iron core of a normal transformer cannot contain it.

The Tesla coil requires one more thing: a capacitor to store charge and fire it all in one huge spark. The circuit of the coil contains a capacitor and a small hole called a spark gap. When the coil is turned on, electricity flows through the circuit and fills the capacitor with electrons, like a battery. This charge creates its own electric potential in the circuit, which tries to bridge across the spark gap. This can only happen when a very large amount of charge has built up in the capacitor.

Eventually so much charge has accumulated that it breaks down the electrical neutrality of the air in the middle of the spark gap. The circuit closes for a fleeting second and a huge amount of current blasts out of the capacitor and through the coils. This produces a very strong magnetic field in the primary coil.

The secondary wire coil uses electromagnetic induction to convert this magnetic field to an electric potential so high that it can easily break apart the air molecules at its ends and push their electrons in wild arcs, producing enormous purple sparks. The dome on the top of the device acts to make the secondary coil of wires receive energy more fully from the first coil. With some careful mathematical calculations, the amount of electrical energy transferred can be maximized.

Flying blue streamers of electrons flow off the coil and through the hot air searching for a conductive landing place. They heat the air and break it into a plasma of glowing ion filaments before dissipating into the air or surging into a nearby conductor.

A tremendous light show is generated, as well as a loud buzzing, crackling sound, which can be used to play music. The electrical theatrics are so stunning that Tesla was known to use his device to scare and mesmerize visitors to his lab.”

**Reference**:

Hartsfield, T. (2014, January). *How Tesla Coils Work*. Retrieved from https://www.realclearscience.com/articles/2014/01/29/how\_tesla\_coils\_work\_108474.html