

REVERSIBLE THERMOELECTRIC DEMONSTRATOR**Materials:**

- ✓ Thermoelectric Motor
- ✓ 2 250 mL Glass Beakers for set up?
- ✓ 1 500 mL Glass Beaker for Heating Water
- ✓ 1 500 mL Glass Beaker full of ice water
- ✓ Hot Plate
- ✓ Ice Water
- ✓ 2 Thermometers
- ✓ Optional: Red and Blue Food Coloring.
- ✓ Possibly materials for stabilizing apparatus?
- ✓ Voltmeter
- ✓ 6VDC power source

**Background Research:**

1. Define the Following Terms:
 - a. Voltage
 - b. Electric Current
 - c. Electricity
 - d. Thermoelectricity
 - e. Specific Heat Capacity
2. Thermoelectricity refers collectively to the following effects. Elaborate on how each effect contributes to thermoelectricity.
 - a. Seebeck effect
 - b. Peltier effect
 - c. Thompson effect

Scientific Investigation:

- ➔ Fill one of the larger beakers with water and put it on Hot Plate. Heat until boiling (@ least near 100°C) you will record final temp of your hot water.
- ➔ While water is heating, prepare ice water solution. You will record final temperature of cold water.
- ➔ (optional step) put red food coloring in hot water and blue food coloring in cold water.
- ➔ Set up apparatus as pictured to the top right.
- ➔ Make sure that the switch is flipped so that the fan will activate (*to the left when viewed from the back*)
- ➔ Pour the hot water into one of the beakers of the apparatus
- ➔ Pour the cold water into the other beaker of the apparatus
- ➔ Observe the fan blades spinning.
- ➔ *After a few minutes, remove the legs from the water baths. Make note about the behavior of the fan.
- ➔ Replace the Legs back into the water baths, use voltage meter to measure the voltage difference between positive (red) and negative (black) terminals.
- ➔ As the hot water cools and the cold water warms repeat the previous step. Collect voltage and temperature data.

Reverse the Effect: (pending Coach Hyde acquiring a few more materials)

- Pour out all water.
- Set the apparatus back up, but this time each water bath should be equal temperature. Record the temperature of each bath.
- Make sure switch on motor is flipped back to original spot (*to the right when viewed from the back*)
- Use banana clips to connect motor to a 6 VDC power source.
- Observe the resulting temperature change, be patient, water has a high specific heat and takes a long time to heat up/cool down.

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Reflection/Conclusion:

3. Graph your data of Change in Voltage do to temperature decreasing temperature gap/difference.
4. Describe how the temperature gap/difference causes the fan blades to spin. Be specific, use vocabulary.
5. Describe how connecting a power supply moves heat. Be specific, use vocabulary.
6. Discuss what happened when you removed the legs from the water baths. Was the thermoelectric motor still working, did it continue working, etc... This step was marked with an *.
7. Create a 5-minute max loom video in which you will recreate this experiment. You do not have to go through same amount of time/steps. Your goal is to show the thermoelectric motor working both ways. Your job is to explain the physics of how it is working using the vocabulary you have learned. Copy and paste your link into the google form shared in your google classroom.

Time (minutes)	Hot Beaker Temp.	Cold Beaker Temp	Temperature Gap	Voltage
0 (initial)				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Reverse the Effect

Time	Beaker 1 Temp.	Beaker 2 Temp.	Temperature Gap	Voltage Supply
0 (initial)			0	6 VDC
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				