ISIM Lab 2- Thermistor

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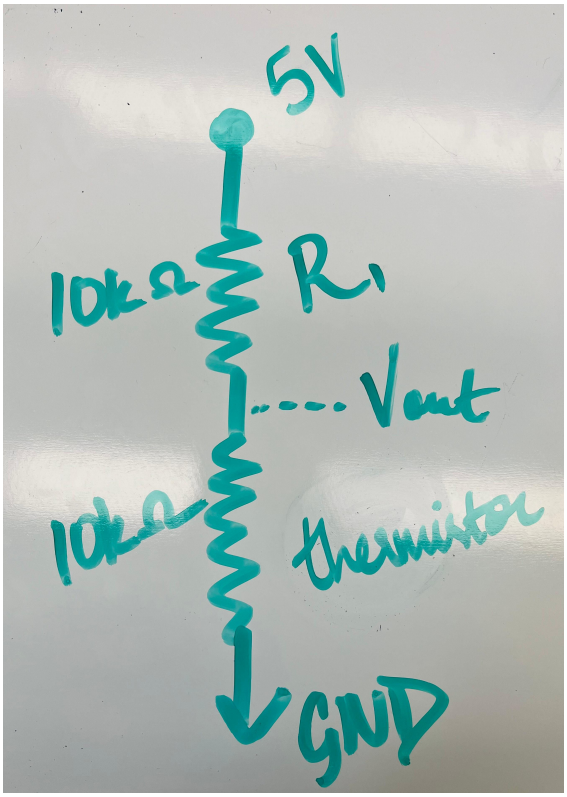
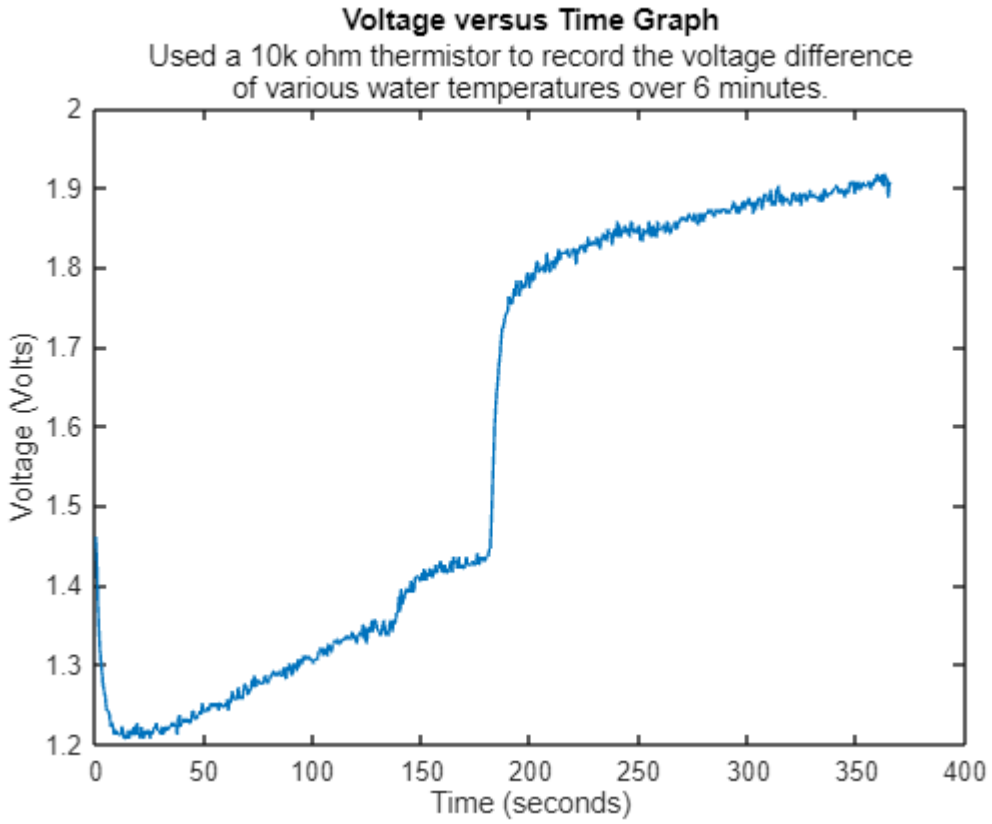
Circuit Diagram:

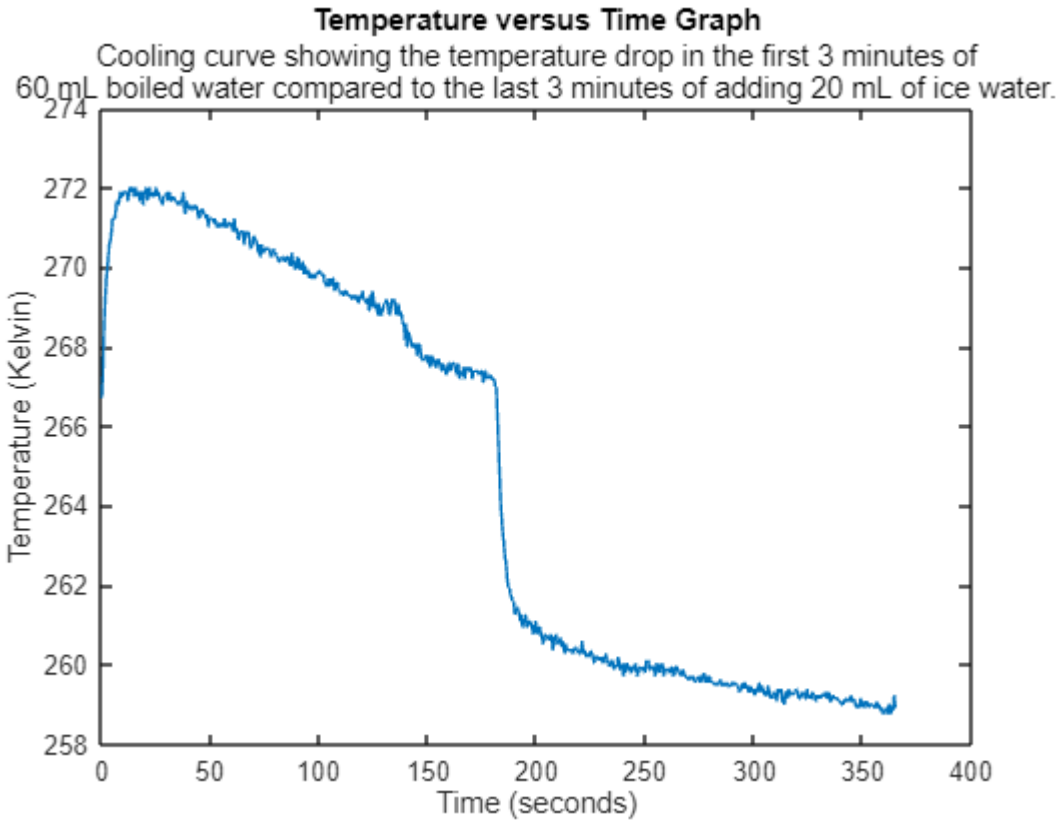


Matlab Code & Graphs

```
clear; % clears memory - useful if you run many scripts in the same session
clf;

%take in data from csv file
tname='thermistor.csv';
datatable  = readtable(tname);
time  = datatable.Var6;
voltage    = datatable.ch1;

figure;
plot(time, voltage)
xlabel('Time (seconds)');
ylabel('Voltage (Volts)');
title('Voltage versus Time Graph')
subtitle({'Used a 10k ohm thermistor to record the voltage difference', 'of various
water temperatures over 6 minutes.'})
```




```
resistance = ((5.1./voltage)*10000) - 10000;
% transfer equation
temp = 1051344 ./ (3528 - 298 .* log(resistance ./ 100000));

figure;
plot(time, temp)
xlabel('Time (seconds)');
ylabel('Temperature (Kelvin)');
title('Temperature versus Time Graph')
subtitle({'Cooling curve showing the temperature drop in the first 3 minutes of',
'60 mL boiled water compared to the last 3 minutes of adding 20 mL of ice water.'})
```



Analysis:

The temperature drop is representative of starting with boiling water and adding ice water halfway through. Over the 6 minutes, the temperature of the water is bound to drop, especially with the biggest fall in the middle. In the first 3 minutes, the temperature of the boiling water gradually decreases in a steady manner until the ice water is added, after which there is a sudden drop for about 15-20 seconds. The last 3 minutes follow a similar gradual decrease in temperature as the first 3 minutes. This slight slope of decrease in temperature would eventually stop and level out based on room temperature, possibly leaving a tail as time goes on.

Conceptual Focus:

My choice of resistor was the 10k ohm one because it was the same as the thermistor. When I tested out a resistor with a significantly lower resistance, for instance 100 ohms, the voltage reading was extremely low (in mV). Theoretically, a lower resistance allows a significantly higher current to flow through the circuit, causing a larger voltage drop. Additionally, this phenomenon can be seen mathematically from the formula: V_out = V_in (R1/R1 + R2). In the case of R2 being extremely large, V_out will be a small fraction of V_in because the resistance of R2 dominates the total resistance, reducing the voltage output significantly. If R2 is extremely small (approaching zero), V_out will approach V_in because the voltage drop across R1 becomes negligible.