

Student Worksheet

Lesson 1: The Effect of Temperature on the Electrical Resistance Properties of a Thermistor

Objective: A thermistor is a semiconductor, a group of materials classified as having properties of both conductors and insulators. Semiconductor materials have resistance levels between those of a conductor and an insulator. They are commonly found in almost all electronic devices. Good examples of semiconductor materials are germanium, selenium, gallium nitride, and silicon. Silicon is the most used semiconductor in computer and electronic components. This experiment illustrates how temperature affects electrical resistance of a semiconductor.

Materials:

- A variety of resistance level NTC thermistors
- Thermometer
- Hot plate
- Ohmmeter
- Ice
- Beaker
- Ring Stand
- Clamp
- Tongs

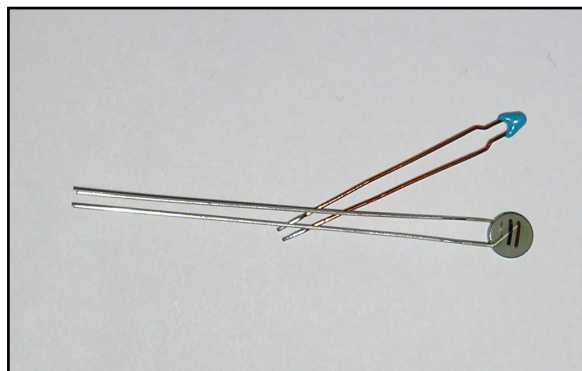


Figure 1. NTC thermistors.

Procedure:

1. Place a clamp on a ring stand.
2. Affix a thermistor to the clamp on the ring stand.
3. Place the ring stand over cool a hot plate.
4. Add water and ice to a large beaker.
5. With a thermometer record the temperature of the ice water. Try to obtain a temperature close to 0°C.
6. Place the beaker on a cool hot plate and lower the thermistor leads into the ice water.
7. Let the thermistor sit in the ice water for a few minutes to obtain equilibrium.
8. With an ohmmeter record the resistance of the thermistor across its leads. Enter this in Table 1.
9. Turn on the hot plate.
10. Record the temperature and corresponding resistance at 5° C intervals in Table 1, until boiling occurs.

Record Data:

Data Table 1. Temperature and resistance data.

Temperature (°C)	Resistance (Ω)
0	
5	
10	
15	
20	
25	
30	
35	
40	
45	
50	
55	
60	
65	
70	
75	
80	
85	
90	
95	
100	

Resistance of a _____ Thermistor at Different Temperatures

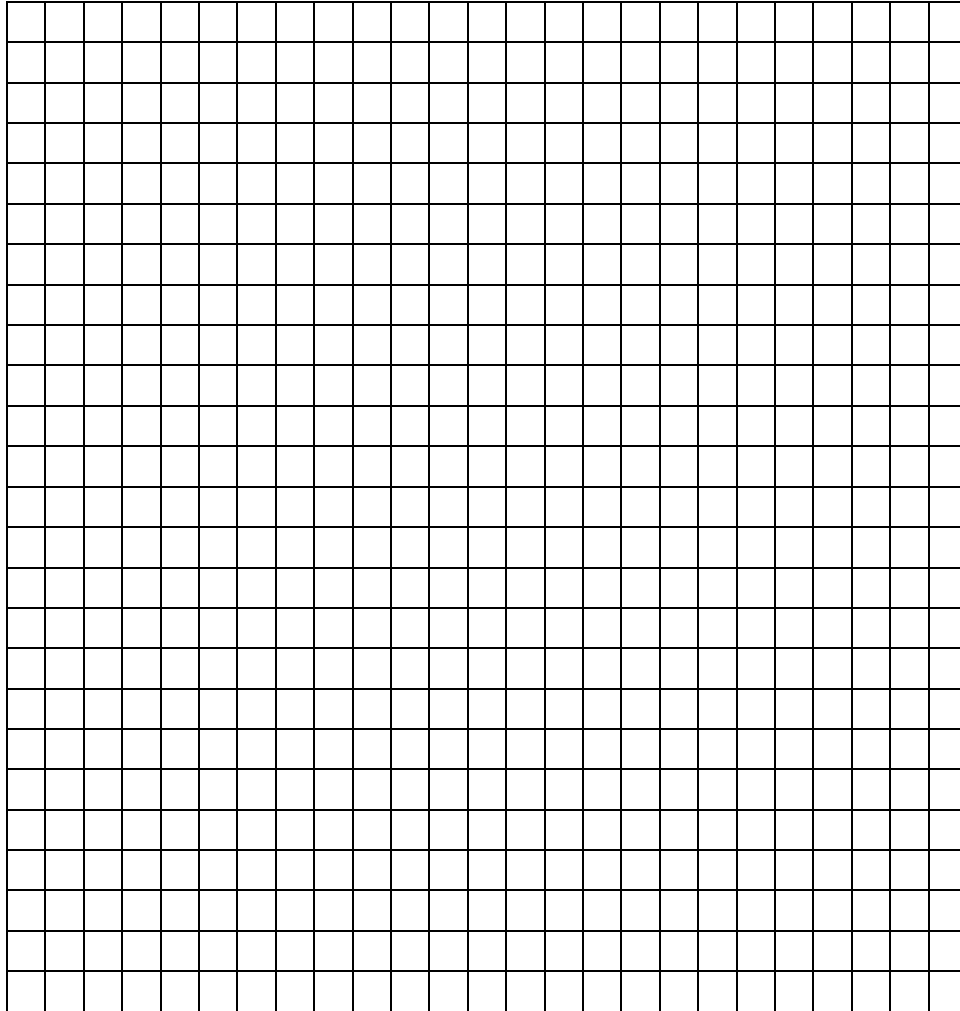


Figure 2. Resistance vs. Temperature data.

Analysis and Conclusion:

1. Plot the data on excel and create a trendline. Which trend type (linear, logarithmic, polynomial, power, or exponential) has the highest R^2 value?

2. If a thermistor were placed in an electrical circuit with constant DC voltage applied, what would be the effect of current through the circuit if the thermistor was heated up?

3. What is the resistance on your thermistor at 22°C?

4. Is the thermistor an ohmic material?

5. When is the thermistor most sensitive to temperature