

## Experiment No. 3

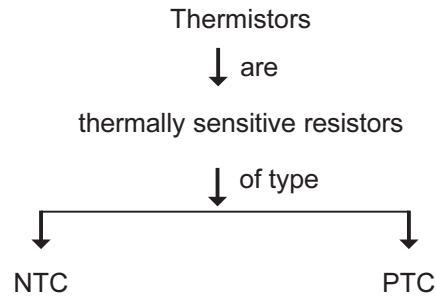
**1.0 Title :** Characteristics of thermistor.

**2.0 Prior Concept :** Temperature, resistance, semi-conductor, hysteresis.

**3.0 New Concepts :**

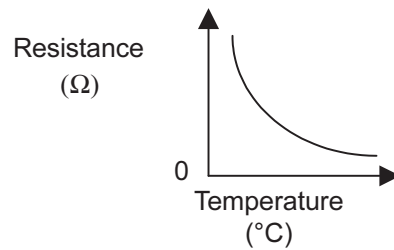
**Proposition :** Thermistors are thermally sensitive resistors, which are of NTC and PTC types.

**Concept Structure :**



**Proposition :** NTC thermistors are those whose resistance decreases with increase in temperature.

**Concept Structure :**



**Proposition :** PTC Thermistors are those whose resistance increases with increase in temperature.  
(Draw the graph for PTC Thermistor and write down concept structure.)

**Concept Structure :**

**4.0 Learning Objectives :**

**a. Intellectual Skills :-**

To draw inference from the graph.

**b. Motor Skill :-**

1. To measure the temperature.
2. To plot the characteristics.

## 5.0 Apparatus :

a. Fill up the following table according to experimental setup.

Sr. No.	Equipment / Component	Specification
1	Thermistor (Shape & Range)	
2	Ohm Meter/DMM	
3	Hot Plate	
4	Mercury Thermometer	

b. Experimental setup:-

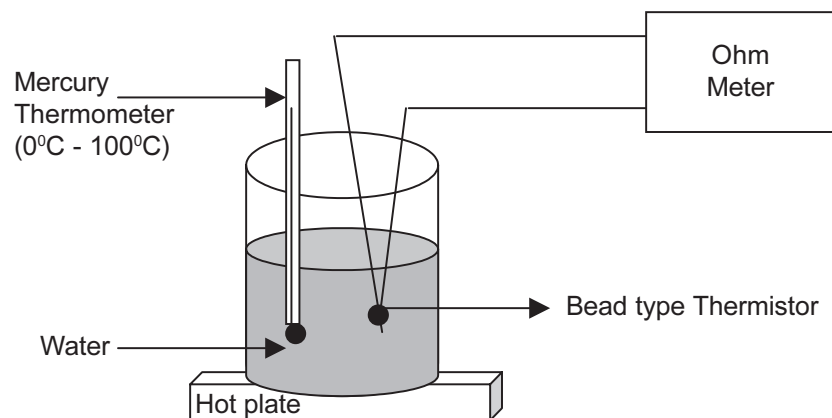


Fig. 4.1: Experimental Setup

## 6.0 Stepwise Procedure :

- 1) Make the connections as per the circuit diagram.
- 2) Increase the temperature of the water in a beaker in steps of 5°C.
- 3) Note down the temperature and corresponding resistance of the thermistor with the help of Ohm meter / DMM.
- 4) Plot the graph of temperature Vs resistance for both sets of reading heating and cooling taken.
- 5) Calculate the value of  $\beta$  by using given formula.

$$R_{T_1} = R_{T_2} \exp \left[ \beta \left( \frac{1}{T_1} - \frac{1}{T_2} \right) \right]$$

Where  $R_{T_1}$  : Resistance of the thermistor at absolute temperature  $T_1$ °K

$R_{T_2}$  : Resistance of the thermistor at absolute temperature  $T_2$ °K

$\beta$  : a constant depending upon the material of thermistor, typically 3500 to 4500 °K.

**OBSERVATION TABLE**

Sr. No.	Temperature ( °C )	Resistance	
		Heating	Cooling
1	Room temperature		
2	35		
3	40		
4	45		
5	50		
6	55		
7	60		
8	65		
9	70		
10	75		
11	80		
12	85		
13	90		
14	95		
15	BP water (100°C)		

**7.0 Result :** Value of  $\beta$ 

1. While heating
2. while cooling

**8.0 Conclusion :** Comment on the nature of the graph and hysteresis of the curve**9.0 Questions :** ( Attempt 3-5 questions as directed by the teacher)

1. Mention the type of Thermistor used, based on shape.
2. Mention the different ranges of Thermistor based on shapes.
3. Give two applications of Thermistor.
4. What is the maximum value of Thermistor resistance in the experiment?
5. What are the two basic types of Thermistor?
6. Differentiate between Thermistor and RTD on the basis of principle.
7. On the basis of observations state whether Thermistor is a linear or nonlinear transducer.
8. Draw sketch of bead, probe, disk, rod type thermistor.
9. Which materials are used for preparing the Thermistor?
10. What are the different ways to excite thermistor?
11. State whether cold junction compensation is needed for thermistor. Justify the answer.
12. What is the contact and lead resistance problem?
13. Comments on the obtained value of  $\beta$  with specification sheet.

**(Space for answer)**

**GRAPH**

