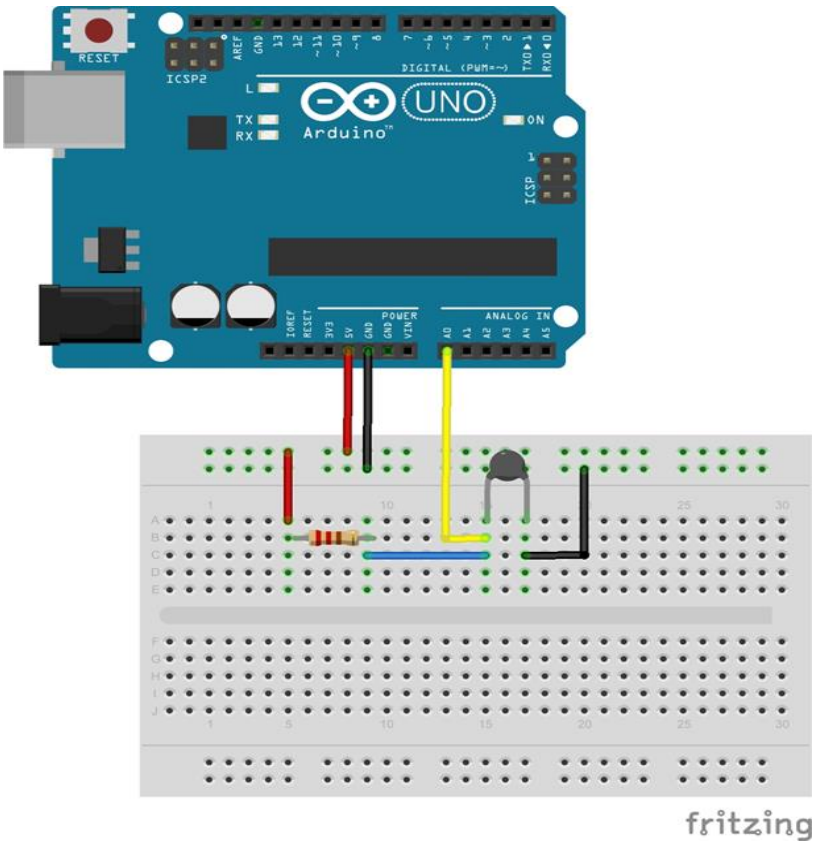
THERMISTOR

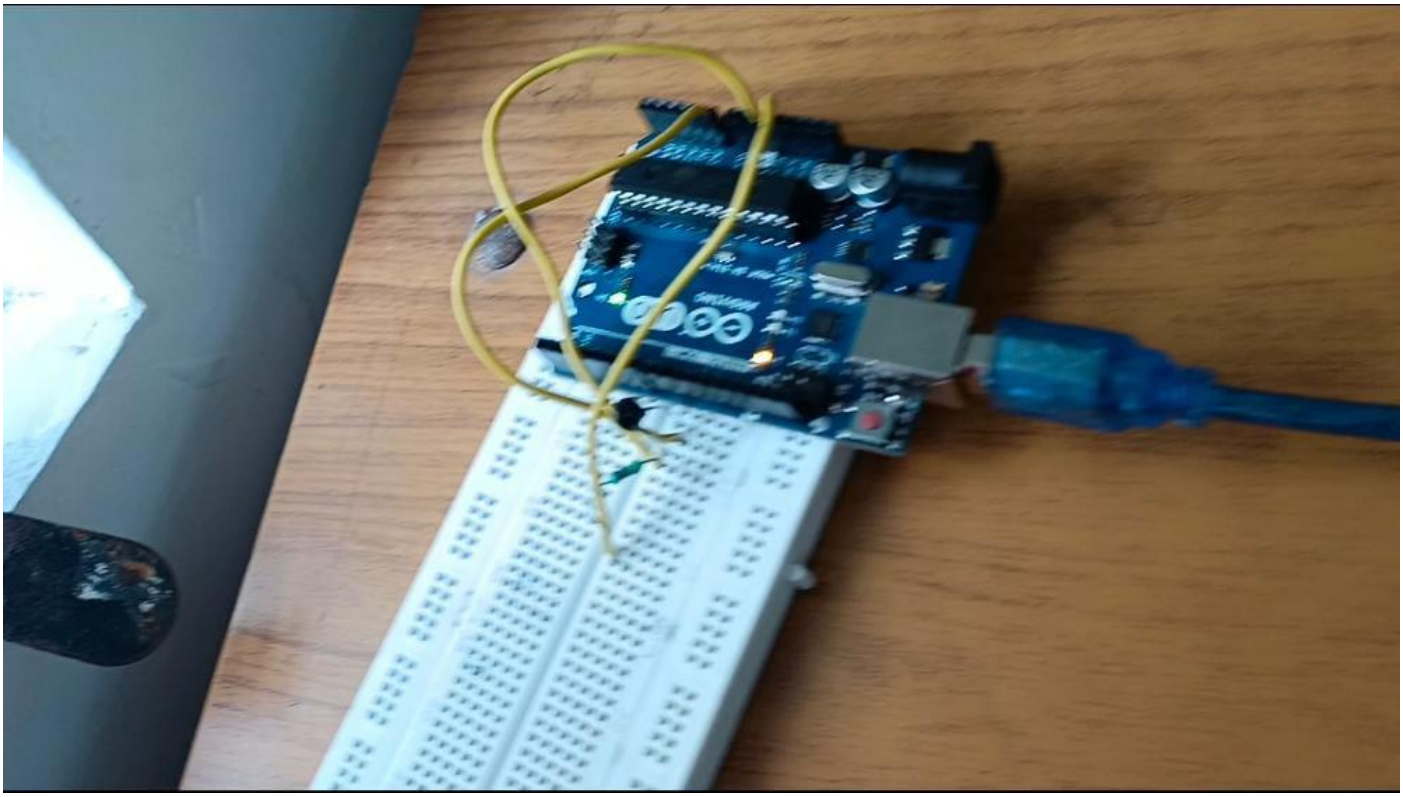


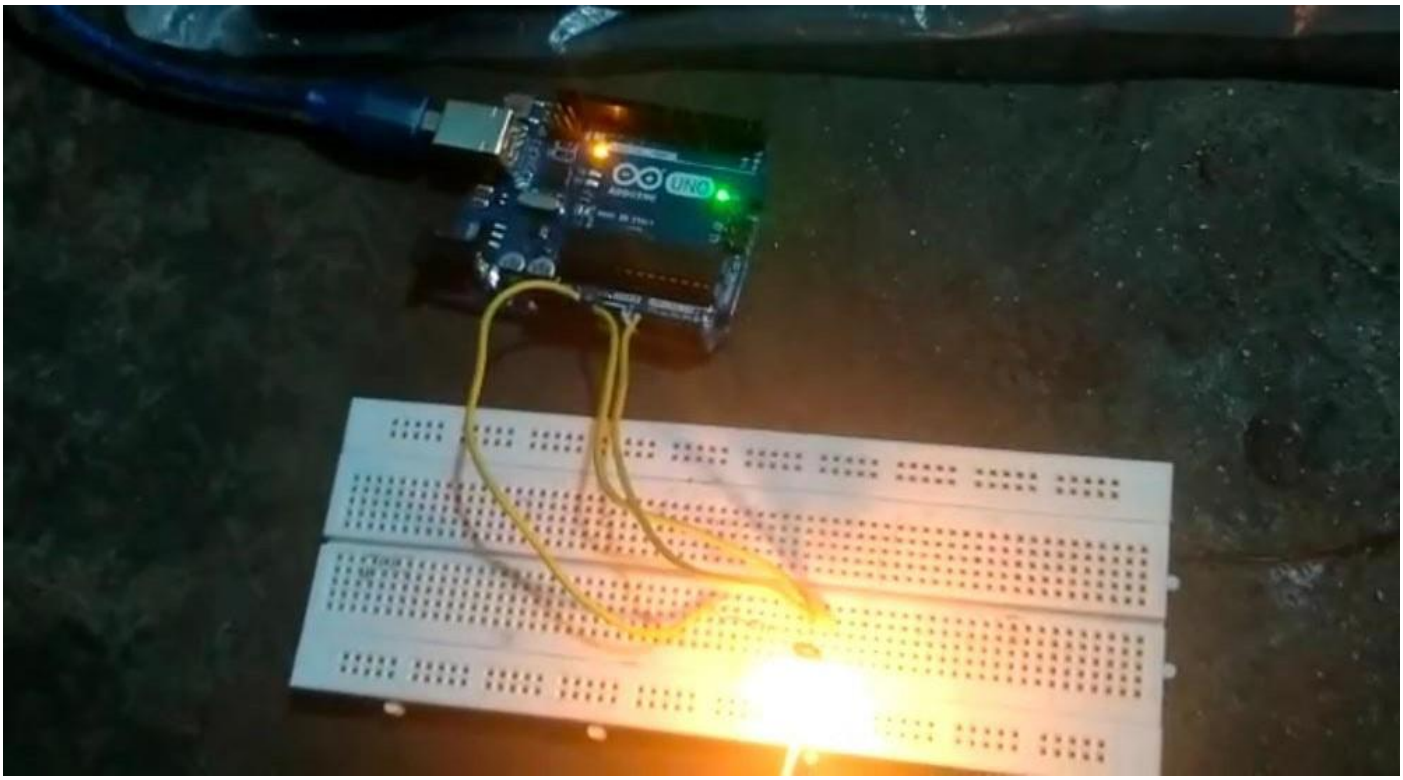
➢ PROGRAM

```
//Thermometer with thermistor
/*thermistor parameters:
* RT0: 10 000 Ω
* B: 3977 K +- 0.75%
```

```
 * T0:  25 C
 * +- 5%
 */

//These values are in the datasheet
#define RT0 10000   // Ω
#define B 3977      // K
//--------------------------------------


#define VCC 5    //Supply voltage
#define R 10000  //R=10KΩ

//Variables
float RT, VR, ln, TX, T0, VRT;

void setup() {
  Serial.begin(9600);
  T0 = 25 + 273.15;                 //Temperature T0 from
datasheet, conversion from Celsius to kelvin
}

void loop() {
  VRT = analogRead(A0);             //Acquisition
analog value of VRT
  VRT = (5.00 / 1023.00) * VRT;     //Conversion to
voltage
  VR = VCC - VRT;
  RT = VRT / (VR / R);              //Resistance of RT
```

```
  ln = log(RT / RT0);
  TX = (1 / ((ln / B) + (1 / T0))); //Temperature from thermistor

  TX = TX - 273.15;                 //Conversion to Celsius


  Serial.print("Temperature:");
  Serial.print("\t");
  Serial.print(TX);
  Serial.print("C\t\t");
  Serial.print(TX + 273.15);        //Conversion to Kelvin
  Serial.print("K\t\t");
  Serial.print((TX * 1.8) + 32);    //Conversion to Fahrenheit
  Serial.println("F");
  delay(500);

}
```





➢ ABOUT THERMISTOR

- ❖ **A thermistor is a type of resistor *whose resistance is dependent on temperature.* There are two opposite types of thermistor:**

- **PTC (Positve Temperature Coefficent), resistance increases as temperature rises**
- **NTC (Negative Temperature Coefficent), resistance decreases as temperature rises**

In this case I use NTC.

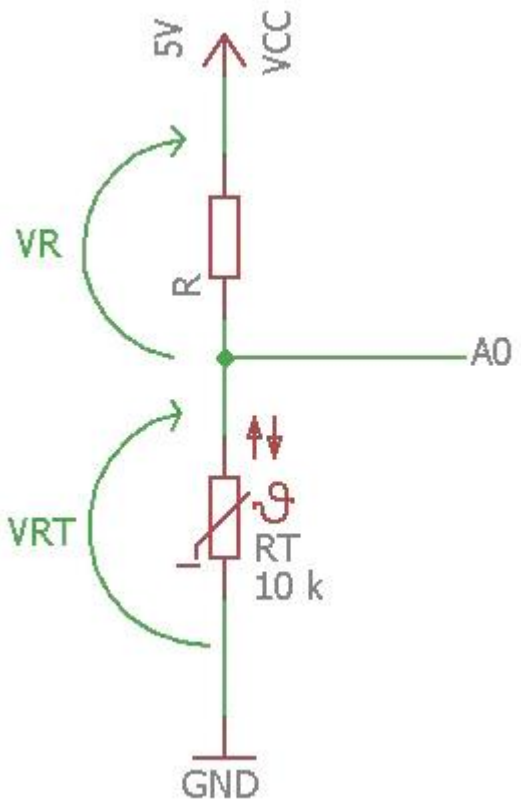
- ❖ **To calculate the thermistor resistance using a simple formula called *equation with parameter B* (with only NTC termistor).**

$$RT = R0 \cdot e^{B\left(\frac{1}{T} - \frac{1}{T0}\right)}$$

- ❖ **Where:**

- **e is the base of natural logarithm**
- **R0 is the resistance of the thermistor measured at the temperature T0**
- **B is a constant coefficient that depends on the characteristics of the material, it is a constant expressed in K, and its value is indicated by the manufacturers on the technical sheets**

To calculate the temperature we need know the resistance RT using the Ohm's laws.



Now we have all the data to calculate the temperature.

$$T = \frac{1}{\frac{\ln(\frac{RT}{R0})}{B} + \frac{1}{T0}}$$

Remember to convert all parameters (for example T0) to Kelvin before the calculations, and also the result is in Kelvin.

Video

https://drive.google.com/file/d/1TxXRfjaqgOeq6YRAJj2qZYYznyhWaFuz/view?usp=drivesdk