Experiment 4. The relation between resistance and temperature

The used devices:-

1- A water tank containing an internal heating source and an electronic thermometer, 2- A copper coil, 3 - An electric source, 3 - A voltmeter, 4 - An ammeter, 5 - Connecting wires.

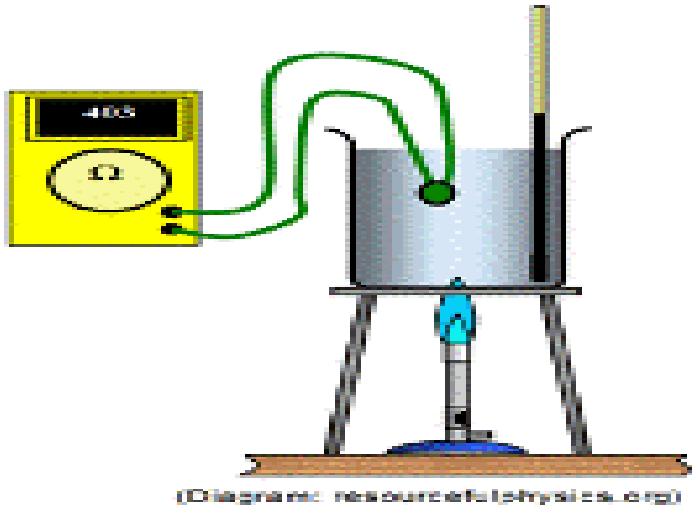
The theory of experiment:

The change in temperature affects the conductivity of materials, because high temperatures lead to an increase in the movement of the molecules that make up the conductive material, and thus an increase in the impediment of the molecules to the electrons passing through the material. The materials are known as having a positive thermal coefficient as all metals or with a negative thermal coefficient such as carbon, because the first its resistance increases linearly with increasing temperature and the second decreases gradually with temperature.

The most used metal is the nickel-chromium alloy to make resistance wires, and one of its disadvantages is that the heat increase coefficient is large. If you measure the current in the hot wire, you will find that it is large in the beginning and then gradually decreases when redness occur.

Therefore, when a copper coil is placed in a container of water and its temperature is raised, the coil's temperature will increase and thus a change in the value of voltage and current, and that the relationship between voltage and current for each reading is given by the following equation.

$$R = V / I$$



(Diagram: resourcefulphysics.org)

The method of experiment:-

1 - Connect the electric coil to a source of current, as well as connect each of the voltmeters and ammeters.

2 - Turn on the heating source and monitor the temperatures.

3 - Record the values of voltage and current with the change of every (20) degrees of temperature.

4 - Calculate the electrical resistance each time by dividing the value of the voltage difference by the current.

5 - Discuss the relationship of voltage, current and resistance with temperatures, each separately through the table values.

6 - Draw a graphic relationship between temperature values on the **x** axis and resistance on the **y** axis and discuss the diagram.

T $(c)^0$	I (amp)	V (volt)	R (ohm)