# A Cool(ing) Idea

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The instruction manual for PASCO scientific's radiation cube lists four experiments that can be done with the system: introduction to thermal radiation, inverse-square law, Stefan-Boltzmann law (high temperature), and Stefan-Boltzmann law (low temperature). I tried the latter two with very satisfactory results. While I was doing the experiments, I realized that another procedure could be done using the radiation cube and an ohmmeter—Newton's law of cooling experiment:

$$T - T_{room} = (T_o - T_{room})e^{-t/\tau} \quad (1)$$

where $T_{room}$ is room temperature, $T_o$ is the initial temperature of a hot object, and $T$ is the temperature of the object at time $t$.

The temperature of the cube (with a 100-W bulb inside) can be obtained by using an ohmmeter to measure a thermistor resistance embedded in the cube. Table I in the manual lists the temperature $T$ as a function of resistance $R$. For temperatures above ~35 °C, I obtained the following relationship:

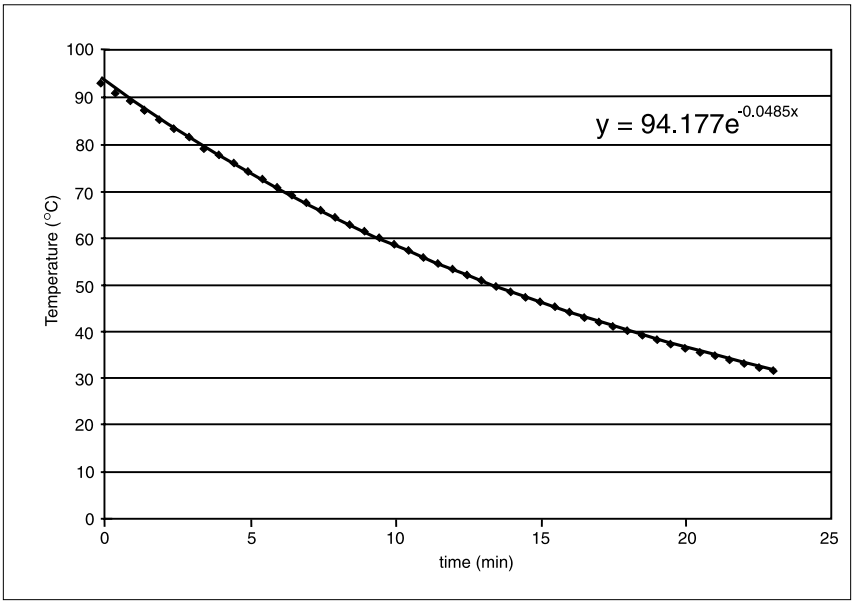


**Fig. 1. A sample cooling curve.**

$$T = -27.85 \ln(R) + 342.8 \quad (2)$$

where $T$ is the temperature of the cube in °C and $R$ is the thermistor resistance in ohms.

The experimental procedure is very simple: (a) Heat the cube to a high temperature. (b) Turn off the power. (c) Measure thermistor resistance $R$ as a function of time $t$. (d) Use Eq. (2) to get the corresponding temperature $T$ of the cube. (e) Plot $T$–$T_{room}$ as a function of time $t$. Figure 1 shows a sample result. The law is easily and nicely shown. Although the experiment could also be done using a thermometer, water, and a calorimeter, readers may find it worthwhile to try the method described here.

## et cetera...

### *Record Magnetic Field*

"...magnet designers have built that Florida-poly-Bitter magnet—a modified version of MIT's technology—that in February reached a world record 33.1 tesla for continuous field by a resistive magnet." [1]

1. B. Keoun, *Science,* **273**, 869 (Aug. 16, 1996).

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