Exercise 3: A Short Report with a Data-Entry Exercise.

In this exercise, experimental data is turned into a graph. The challenge posed here is that the data set provided does not easily generate the graph that is desired.

Objective

The objective of this project is to calibrate two thermocouples—a T-type thermocouple and a J-type thermocouple—for use in a cooling experiment.

Background

Thermocouples differ from traditional thermometers in that they do not provide direct temperature readings. Rather, at a given temperature, a thermocouple produces a certain number of impulses, called counts, per unit of time. The thermocouple is connected to a module, or reader, which reads these counts and translates them into temperature measurements.

T-type thermocouples and J-type thermocouples are accurate over different ranges of temperatures. Both types of thermocouples are required for a subsequent experimental project; two of these thermocouples are here evaluated.

Apparatus and Procedure

A T-type thermocouple and a J-type thermocouple are connected to readers and suspended in a cold-air bath. A previously calibrated thermocouple is suspended in this bath as well, to provide reference points for temperature readings. This container is then placed in a dry ice bath, as shown in Figure 1.

Assignment

Your task is to use the data in Table 1 to generate the graph shown in Figure 2. You are then to prepare a short experimental report describing the project, the procedures and the results.
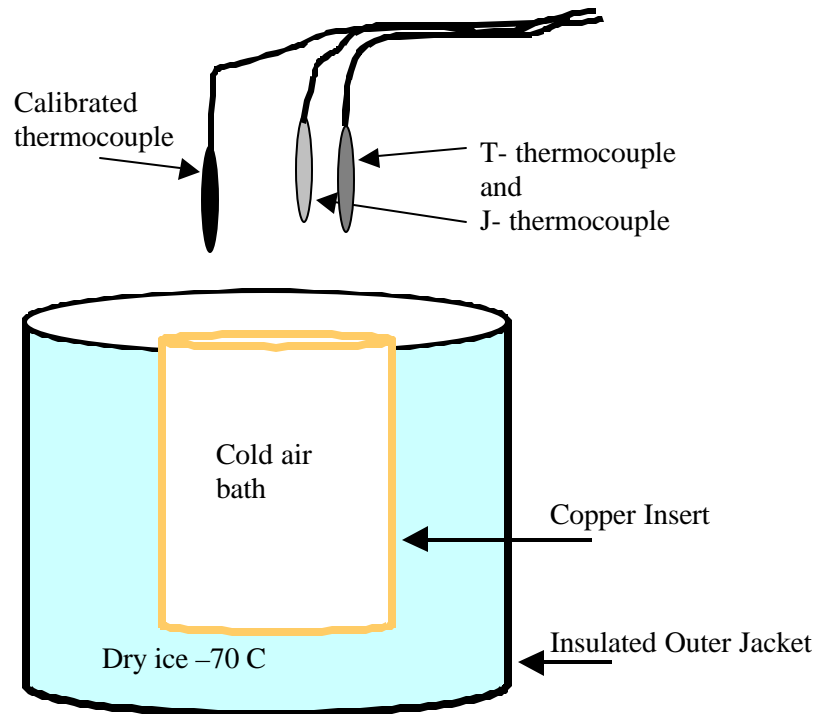
Figure 1. Experimental apparatus for calibration of thermocouples. The thermocouple leads are connected to instruments that are not of interest in this assignment, and are omitted.

Table 1. Data table for calibration of the thermocouples.

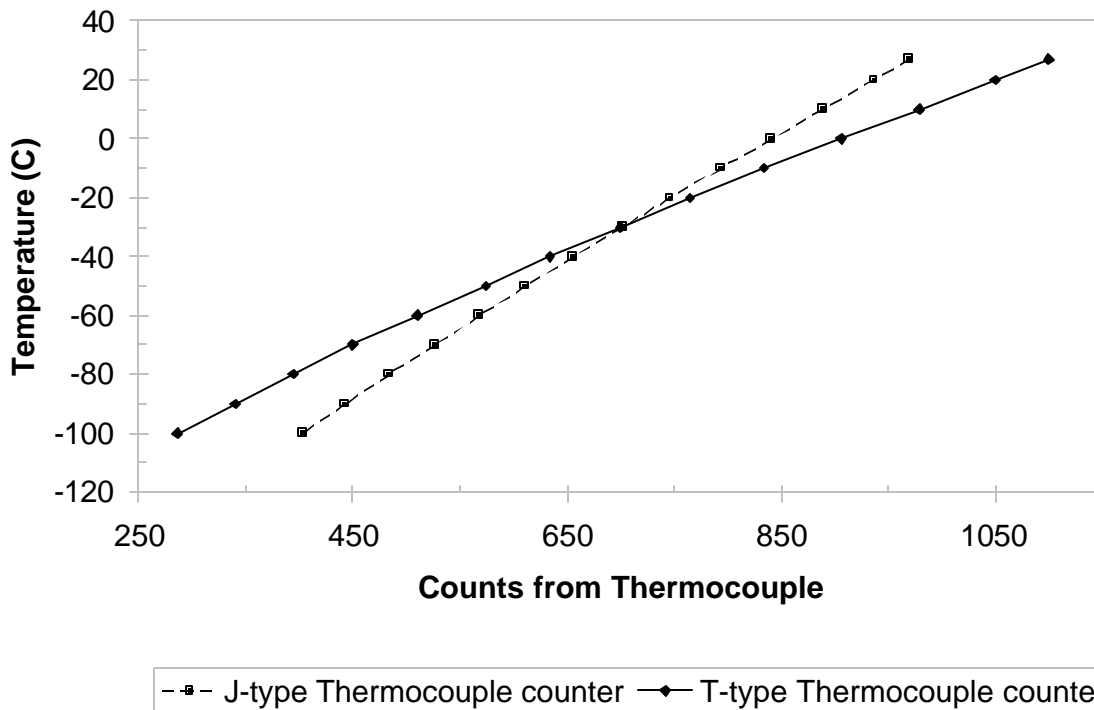| Temp. (C)	T-type count	J-type count
27	1100	970
20	1050	937
10	979	889
0	906	841
-10	834	794
-20	765	746
-30	700	702
-40	634	656
-50	574	611
-60	510	568
-70	450	527
-80	394	484
-90	340	443
-100	286	404

Figure 2. Calibration curves for the J-type thermocouple and the T-type thermocouple of interest.