CHM 101 Project #1 Name_____
Sinex

The Temperature Scales on Thermometers: How are they related?

This project involves deriving the conversion equations for the various temperature scales - Kelvin, Celsius, and Fahrenheit using an interactive Excel spreadsheet, available at http://academic.pgcc.edu/~ssinex/excelets/temperature_scales.xls. Here you will click on the tabs at the lower left of your screen to navigate the workbook.

Click on the thermometers tab, where you will adjust the slider or scroll bar in the upper left to generate data on the three temperature scales. You will need to vary the slider such that you generate 10-12 sets of points that you type in the table. Your data should span the full range of the slider.

For 1 kelvin, how much does the Celsius change?

For 1 kelvin, how much does the Fahrenheit change?

Once you have the data, click on the conversions tab. Here you will find the plots of the temperature scales that allow you to derive the conversions between the scales. These equations are given in generic terms of x and y, you need to formulate them in terms of the temperature scales – K, °C, and °F. Then on the inverse tab, you will find the reverse conversion equations – °C → K

<u>The task</u>
On the extension tab, you will find data for the Rankine temperature scale compared to the Kelvin scale. You will need to derive the following conversion equations from this data along with how the Rankine scale is related to the Celsius, and Fahrenheit scales. To do this, you will need to plot three graphs – K vs. °R, °C vs °R, and °F vs °R, where °R is plotted on the x-axis, and perform the linear regressions to generate the conversion equations. How to plot a graph and generate a regression equation are explained in *Using Excel for Handling, Graphing, and Analyzing Scientific Data*, which is available at http://academic.pgcc.edu/psc/Excelet_booklet.pdf. The inverse conversion equations may be determined graphically or algebraically.

The product

Three labeled graphs with linear regression results shown on the graphs attached to this handout.

Complete the table below with conversion equations written in terms of the temperature scales (not x and y variables). Note the format requested: $x \rightarrow y$

$^{o}R \rightarrow K$	$^{o}R \rightarrow {}^{o}C$	$^{o}R \rightarrow {}^{o}F$
$K \rightarrow {}^{o}R$	$^{o}C \rightarrow {}^{o}R$	$^{o}F \rightarrow {}^{o}R$

Describe or show how you determined the inverse conversion equations.

What is the value of absolute zero (0 kelvin or 0 ^{o}R) on the Fahrenheit scale? Explain or show how you determined this.

Go to the "inventing" tab and create your own temperature scale. List your reference point choices:

FP _____ BP _____

Write the conversion equation from Celsius to your scale.

For 1^{o} Celsius, how much does your scale change?