

Lab 01
Black vs. White
Temperature vs time
R03: 2019

This will be a lab that is designed to measure (if successful) the rate of temperature change of two otherwise identical items. We will construct this system using two identical objects (one black, and one white), two thermometers, and two incandescent flood lights. In this particular lab, you might wonder why not use LED bulbs? The answer is that some wavelengths of light are absent with LED bulbs.

The procedure is this: place a lamp over a black object and a white object. Then monitor and record the temperature of each object every 20 seconds. At some high temperature, the lamps will be switched off and we will do the same procedure for cooling. The data will be placed in a spreadsheet and a graph will be plotted with the ratio of the temperatures vs time. Since the initial reading of the thermometers might be different, the spreadsheet will use an offset correction for the initial temperatures.

We will choose to plot the ratio:

$$Y \equiv \frac{T_{\text{Black}}}{T_{\text{White}}}$$

as a function of time in seconds.

If $Y > 1$, then the black object heats up faster or cools slower than the white object.

If $Y = 1$, then the black object heats at the same rate as the white object.

If $Y < 1$, then the black object heats up slower or cools faster than the white object.

The problem with using a single Y value is that it ignores some information regarding a temperature-dependent Y . We will plot the data on a graph to see if the value is constant or if it changes. By taking the average Y , we will be able to approximately answer the desired question for our given temperature range, but additional information will also be available.

Your paragraph should include the title, your team names, the date, your paragraph, a screen capture of the spreadsheet, and your references. Uniquely, you should have at least one reference that relate to the question which heats and/or cools faster, black or white materials? You will write at least one sentence about this in your report with your reference.

Be sure you pledge your work.