Finding time constants of the black body device

Initially, the blackbody device was at a stable 6.012 K. Then, 49mW of power were supplied to the 20ohm blackbody resistor. The temperatures were recorded until they began to asymptote after 150 minutes. The resulting data was plotted using matplot.lib, and a curve was fit by the curve_fit function of scipy. The curve was fitted to the function: $A - C * e^{-kt}$ Where A is the final temperature of the device, A-C is the initial temperature and *k* is the inverse time constant. Figure (1) shows the measured temperatures in red and the approximated curve in blue. Figure(2) shows the curve alone.

Figure (1)

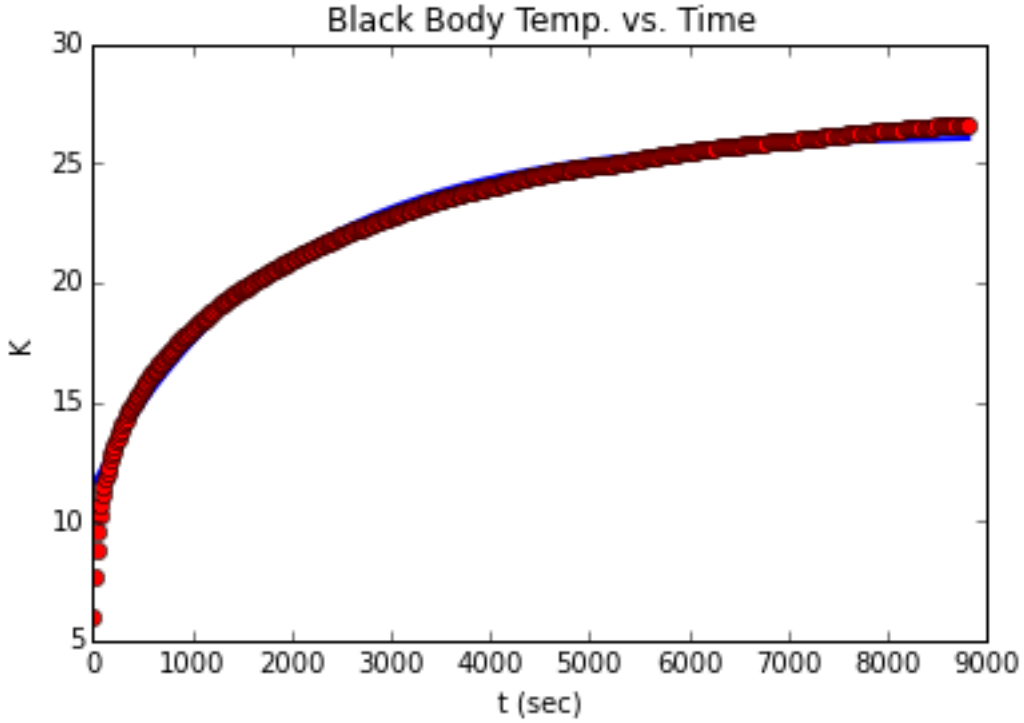
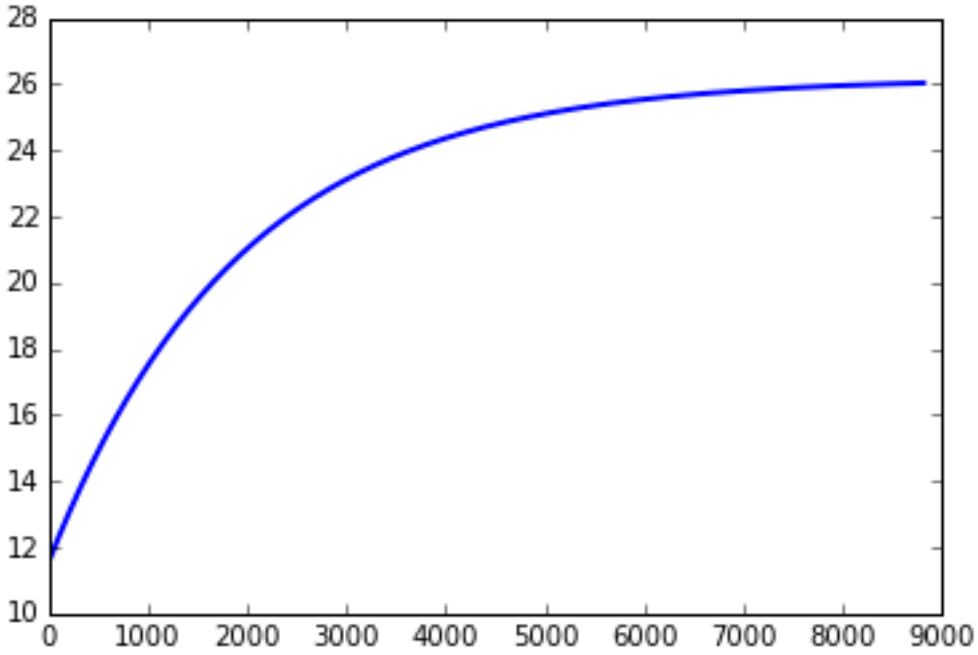


Figure (2)



After the temperature change appeared to be asymptotic, the power to the resistor was increased to 97mW. Measurements were repeated and plotted below:

Figure (3)

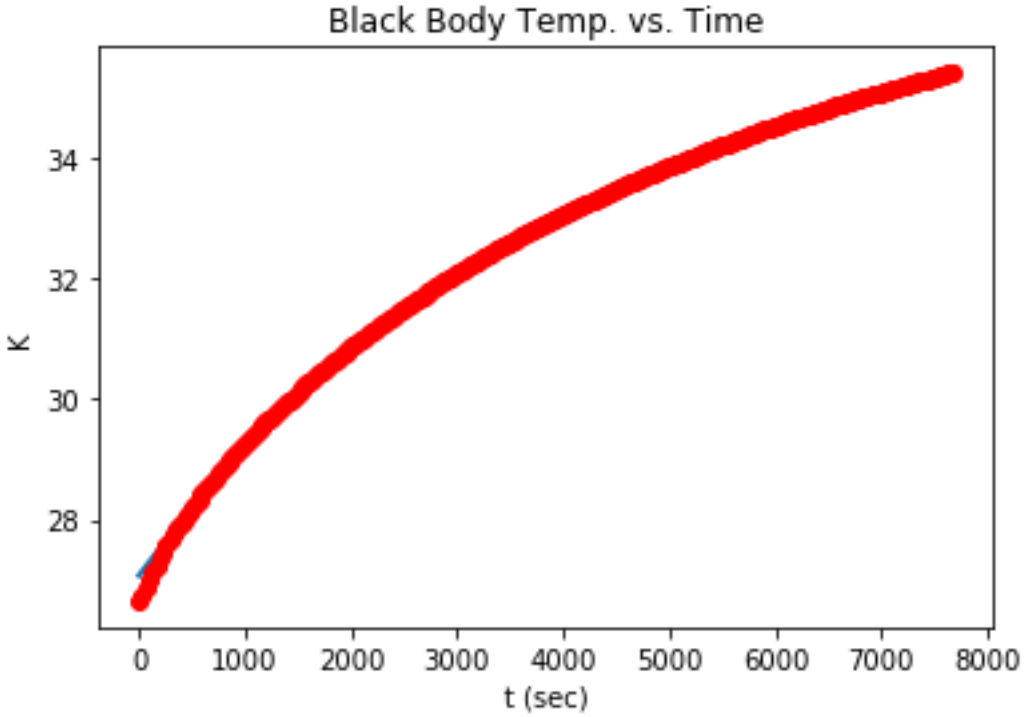
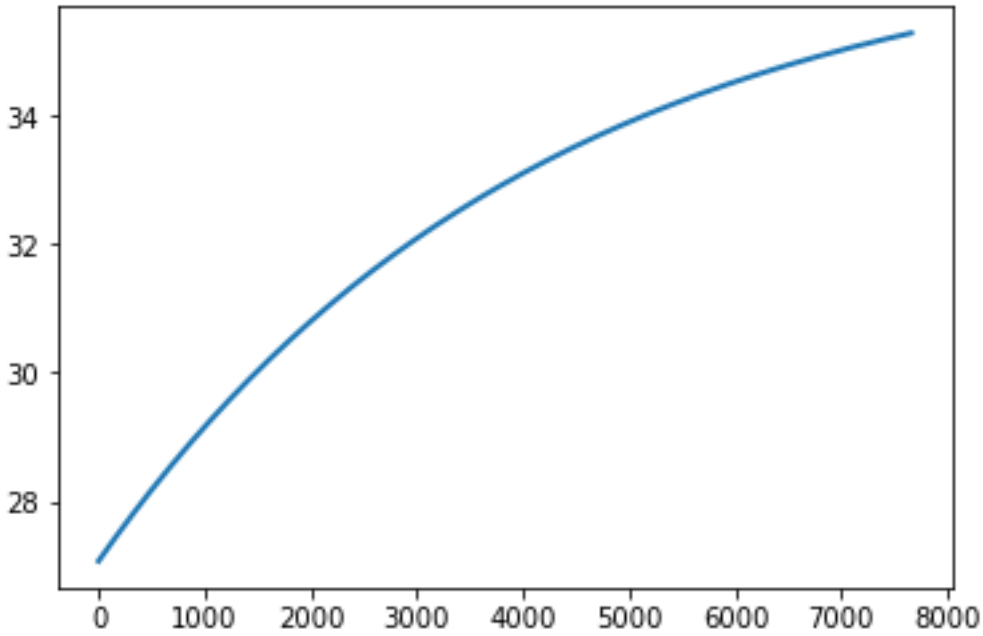
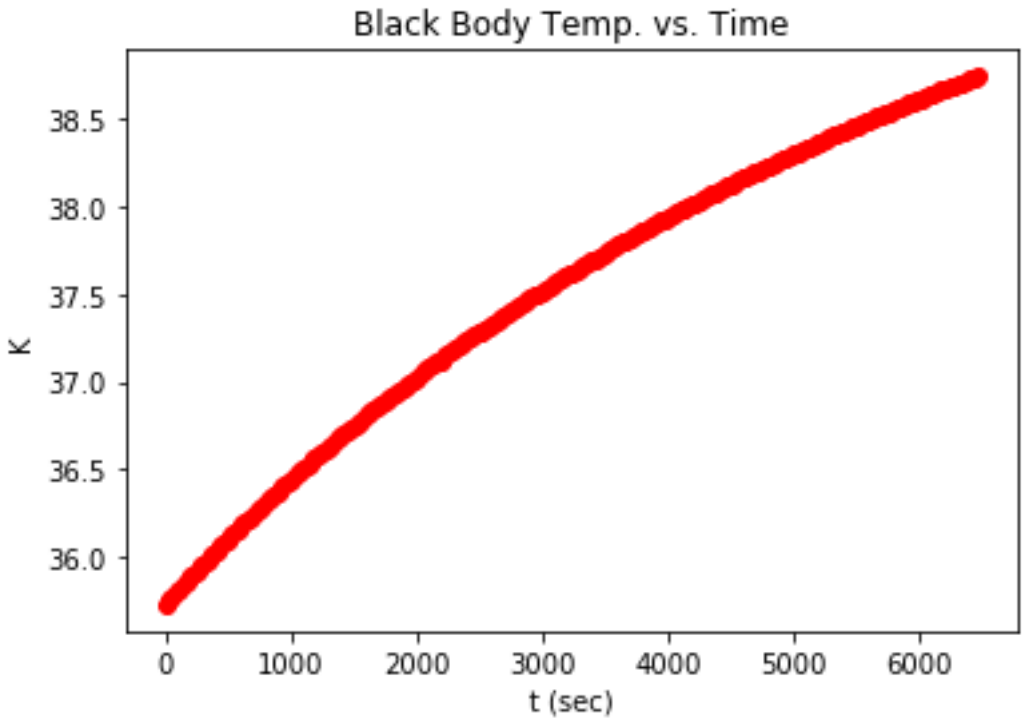
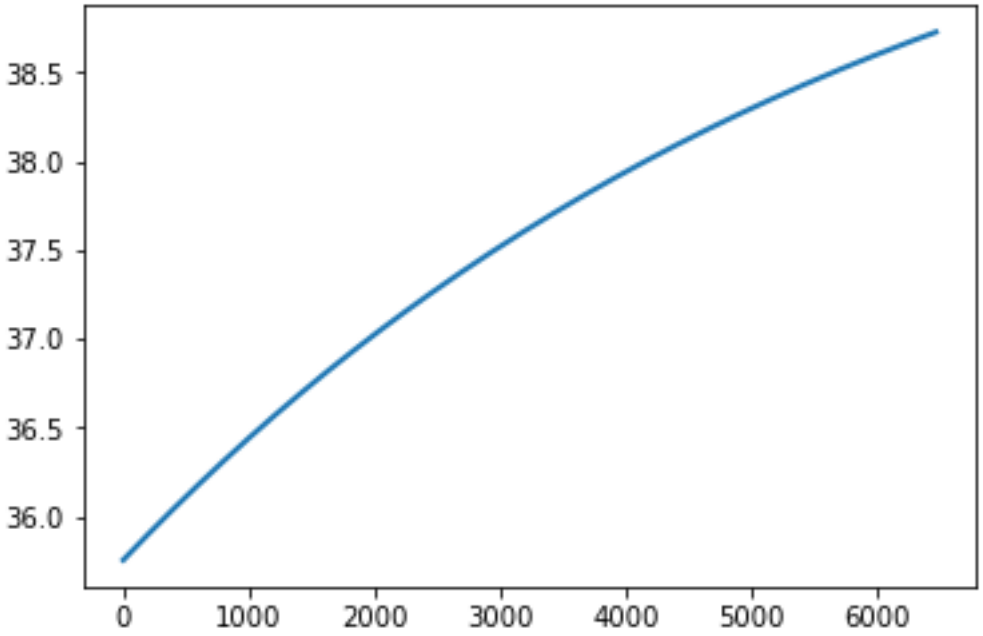


Figure (4)

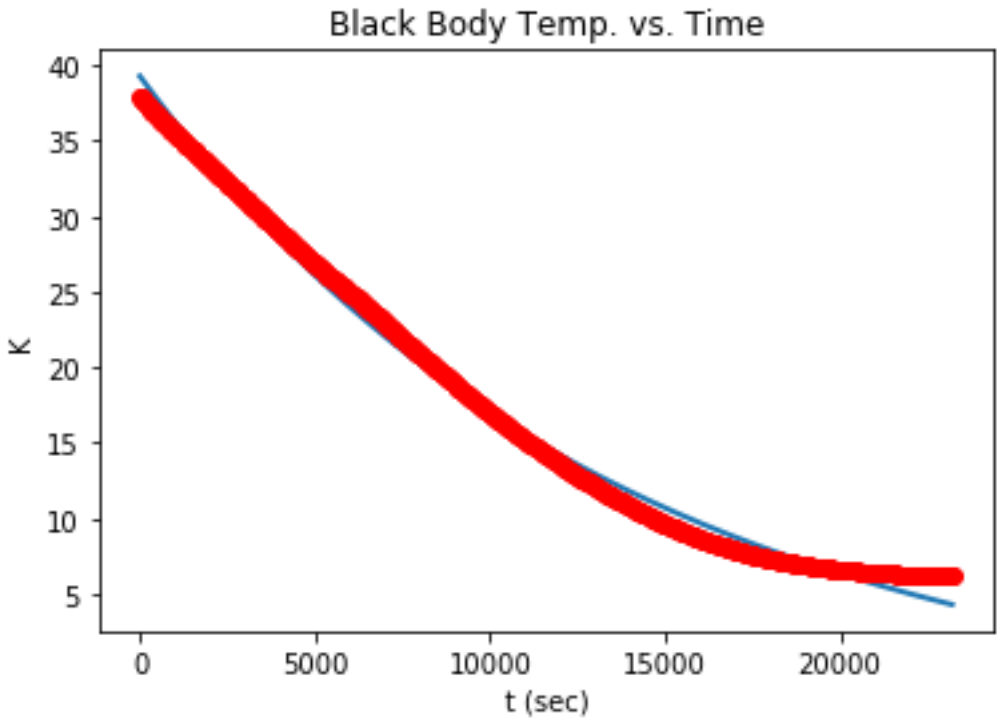


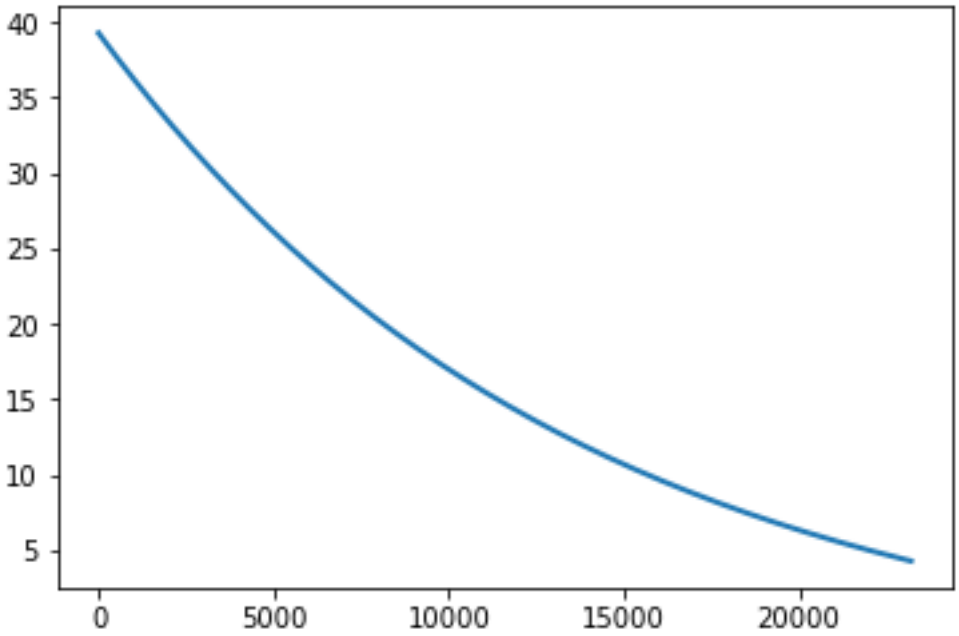
This was repeated again with 108mW:





After three steps were made in increasing temperature, the power was set to zero and the device was allowed to cool. Which is shown below:





Results:
At 49mW of applied power the temperature increased from 6.012K to 26.658K in 155 minutes, with a folding time of **32 min**. At 97mW, the temperature increased from 26.658K to 35.494K in 132 min. with a folding time of **69 min**. At 108mW, the temperature increased from 35.494K to 38.808K in 118 min. with a folding time of **102 min.** When the device was powered off and allowed to cool it took a period of 391 min. to go from 38.808K to 6.166K, a folding time of **255 min.**