

GAS LAWS: HOW PRESSURE AND TEMPERATURE ARE RELATED

APRIL 22, 2024

BONUS HOMEWORK

Note: This time the whole homework is bonus, it does not count towards the total number of homeworks solved. Do it if you are interested to derive by yourself where the absolute zero is from actual experimental data.

1. In class we studied how pressure depends on temperature in a cylinder with gas (which has a fixed volume). Our experimental data gave us the value of absolute zero that was quite a bit off, so here I suggest you to use the data that I collected during the same experiment with an in-person class.

At temperature $t_1 = 58^\circ \text{C}$ pressure was $p_1 = 114.9 \text{ kPa}$ and at temperature $t_2 = 51^\circ \text{C}$ pressure was $p_2 = 112.4 \text{ kPa}$. Through these two points on a $p - T$ plane one can draw a straight line. Find at what temperature this straight line goes through the point of zero pressure, $p = 0$. You may suspect there is something strange about the point where pressure of the gas become zero. In fact, this is the absolute zero temperature!

Hint: one way of solving this problem is to determine by how much does the temperature go down for decreasing pressure by 1 kPa.