

# GAS LAWS: HOW PRESSURE AND TEMPERATURE ARE RELATED

APRIL 6, 2023

## 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 saw the data for pressure dependence on temperature in a cylinder with gas (which has a fixed volume). At temperature  $t_1 = 43.5^\circ\text{C}$  pressure was  $p_1 = 106.65$  kPa and at temperature  $t_2 = 39.5^\circ\text{C}$  pressure was  $p_2 = 105.25$  kPa. Through these two points on a  $p - T$  plane one can draw a straight line. Find where (at what temperature) this straight line intersects the  $t$ -axis, corresponding to  $p = 0$ . This is the absolute zero temperature.

*Hint: one way of answering this is to write the equation of a straight line as  $p = k(t - t_0)$ . Then you can find coefficients  $k$  and  $t_0$  by requiring that this line passes through  $(t_1, p_1)$  and  $(t_2, p_2)$ . This way you will get a system of two equations with two variables  $(k, t_0)$  which you can solve.  $t_0$  is the absolute zero temperature.*