

Absolute Zero



Equipment

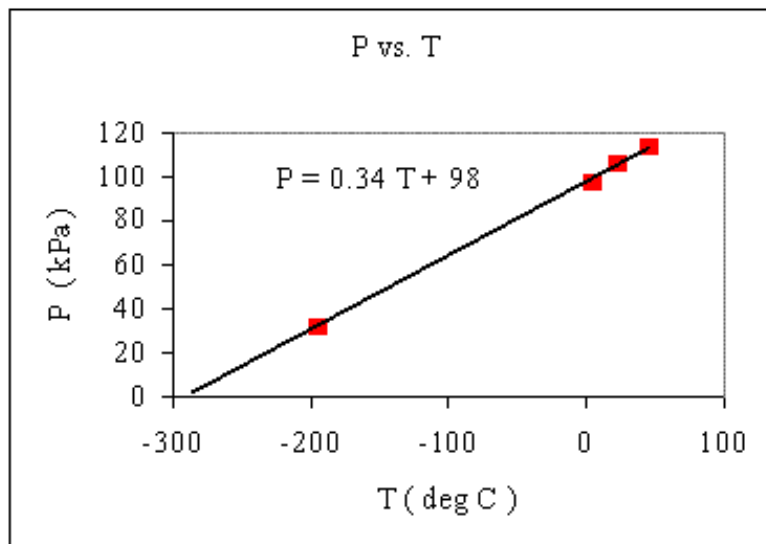
Purpose: Demonstrates the idea of the constant-volume gas thermometer, and by extension the temperature of absolute zero.

By plotting Pressure vs. Temperature for a gas (air) at constant volume, you demonstrate that P is proportional to T . By extrapolating the trend to lower temperature, the idea of absolute zero and the Kelvin scale are introduced.

Note: Ideally, we want data at as widely spaced values of T as convenient. Liquid nitrogen and ice water are easy, but boiling water takes organization, class time, and is a little scary. Instead I used hot tap water (There is a good sink in the back room of 415.).

Here is my data:

	T ($^{\circ}\text{C}$)	P (kPa)
Liquid LN_2	-196	32
Ice water mix	4	98
Room	22	106
Hot tap water	46	114



As seen above, this shows the linear effect pretty well and extrapolates $T_0 = -288^\circ\text{C}$ which is not too far off for a lecture demo.

Extra Equipment: LN_2 container, ice water bucket, the large beaker for hot water, and a thermometer. Also, LN_2 (1st floor) and ice (5th floor). If you intend to boil the hot water then you also need a ring stand and torch.

Additionally, you need a plan for making the graph in class.

Location: Shelf D4