

# Equation of State for an Ideal Gas

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## 1. Results

Table 1 contains various quantities, both measured and given, that were relevant to the analysis. They are collected in a table to assist with lookup.

$T$  is the temperature of the room measured using a digital thermometer. The temperature was initially measured as 71 °F, then converted to kelvins as show in Equation 1.

$$T = \left( \frac{5}{9}(71 - 32) + 273.15 \right) \text{ K} = 294.82 \text{ K} \quad (1)$$

$P_0$  is the atmospheric pressure measured using a digital barometer. The pressure was initially measured as 28.93, then converted to pascals as shown in Equation 2.

$$P_0 = (28.93 \text{ in Hg}) \cdot \frac{25.4 \text{ mm Hg}}{1 \text{ in Hg}} \cdot \frac{101\,325 \text{ Pa}}{760 \text{ mm Hg}} = 97\,968 \text{ Pa} \quad (2)$$

$m_p$  is the mass of the piston & platform, taken from the label on the gas law apparatus.  $D$  is the piston diameter, taken from the label on the gas law apparatus.

Some constants that were needed in the analysis were the universal gas constant  $R$  and the acceleration due to gravity  $g$ . Both values were taken from the lab manual. Note that the value of  $g$  used is for the science building, where the experiment was performed.

Table 1: Miscellaneous Quantities

Quantity	Value
$T$	294.82 K
$P_0$	97 968 Pa
$m_p$	35.0 g
$D$	32.5 mm
$R$	8.314 J mol <sup>-1</sup> K <sup>-1</sup>
$g$	9.7955 m s <sup>-2</sup>

## 2. Analysis