

Answer on Question #67288, Physics / Molecular Physics | Thermodynamics

At 0 degree celcius the pressure of the gas in constant volume gas thermometer is 30cm Hg.

Calculate the temperature when the pressure of the gas is 50 cm of Hg

Find: $T_2 - ?$

Given:

$$T_1 = 273 \text{ K}$$

$$P_1 = \frac{30 \text{ cm Hg}}{76 \text{ cm Hg}} \times 1.013 \times 10^5 \text{ Pa} = 0.4 \times 10^5 \text{ Pa}$$

$$P_2 = \frac{50 \text{ cm Hg}}{76 \text{ cm Hg}} \times 1.013 \times 10^5 \text{ Pa} = 0.67 \times 10^5 \text{ Pa}$$

Solution:

Gay-Lussac's Law:

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \quad (1)$$

$$\text{Of (1)} \Rightarrow T_2 = \frac{P_2}{P_1} T_1 \quad (2)$$

$$\text{Of (2)} \Rightarrow T_2 = 457 \text{ K} \quad (3)$$

$$\text{Of (3)} \Rightarrow t_2 = +184 \text{ }^\circ\text{C}$$

Answer:

$$+184 \text{ }^\circ\text{C} (457 \text{ K})$$

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