Chapter 5 − Problem 48

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48. Consider two bulbs separated by a valve. Both bulbs are maintained at the same temperature. Assume that when the valve between the two bulbs is closed, the gases are sealed in their respective bulbs. When the valve is closed, the following data (1) apply. Assuming no temperature change, determine the final pressure inside the system after the valve connecting the two bulbs is opened. Ignore the volume of the tube connecting the two bulbs.

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\begin{aligned}
\text{mol}_{CO_2} \cdot T &= \frac{1.25 \cdot 3}{.0821} \\
&= 45.68T \\
\text{mol}_{CH_4} \cdot T &= \frac{2.66 \cdot 6}{.0821} \\
&= 194.4T \\
\text{mol}_{total} &= 45.68 + 194.4 \\
&= 240.07[\text{mol}] \\
\frac{n_{CH_4}}{P_{CH_4} \cdot V_{CH_4}} &= \frac{n_f}{P_f \cdot V_f} \\
\frac{\left(\frac{n_f}{n_{CH_4}}\right) \cdot P_{CH_4} \cdot V_{CH_4}}{V_f} &= \frac{\left(\frac{240.07}{194.4}\right) \cdot 2.66 \cdot 6}{9} \\
&= 2.19[\text{ATM}]
\end{aligned}
\tag{1}
$$

	Bulb X	Bulb Y
Gas	CO_2	CH_4
V	3.00[L]	6.00[L]
P	1.25[ATM]	2.66[ATM]

Table 1: Data for Bulb X and Bulb Y