Answer on Question #66231, Chemistry, General Chemistry

Part C

A cylinder with a movable piston contains 2.00 g of helium, He, at room temperature. More helium was added to the cylinder and the volume was adjusted so that the gas pressure remained the same. How many grams of helium were added to the cylinder if the volume was changed from 2.00 L to 4.10 L ? (The temperature was held constant.)

Solution:

Data:	**Solution:**
m_1 (He) = 2.00 g $t_1 = 25^0C$ V_1 = 2.00 L V_2 = 4.10 L $P_1 = P_2$ $T_1 = T_2$	First of all, we can calculate the amount of helium, using equation: $n_1 = \frac{m_1(He)}{M(He)}$, where M(He) is molar mass of helium, according to Periodic table M(He) = 4.00 g/mol. Thus: $n_1 = \frac{2.00}{4.00}$ = 0.5 (moles) According to general relationship, known as the ideal gas equation: PV = nRT We can calculate the number of moles, when volume increases: $\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$ Where: $n_2 = \frac{n_1 \cdot T_2 \cdot P_2 \cdot V_2}{P_1 \cdot V_1 \cdot T_2}$ Using given conditions ($P_1 = P_2$, $T_1 = T_2$) and values: $n_2 = \frac{n_1 \cdot V_2}{V_1} = \frac{0.5 \cdot 4.10}{2.00}$ = 1.025 (moles) After that we can determine the mass m_2 of helium gas: $m_2(He) = n_2 \cdot M(He) = 1.025 \cdot 4.00 = 4.10$ (g)

	The difference between m_1 and m_2 is: $\Delta m = m_2 - m_1 = 4.10 - 2.00 = 2.10$ (g) Thus, 2.10 grams of helium, were added to the cylinder.
Calculate: Δm = ?	**Answer:** Δm = 2.10 g.

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