Question#19115

Yet another balloon is inflated to a volume of 434 cm3 using 0.141 moles of dry hydrogen gas. An additional

0.129 grams of hydrogen is then injected into the balloon at constant pressure and temperature. Calculate the

new volume of the balloon (in cm3).

Solution:

Let:

$V_0 = 434 \ cm^3$

$n = 0.141 \ moles$

$m = 0.129 \ g$

$V_1 - ?$

The mass of 1 moles of hydrogen (H$_2$) is:

$M_{H_2} = 2 * 1 = 2 \ g/mol$

The previous mass of hydrogen in balloon is:

$m_0 = \frac{M_{H_2}}{n}$

$$\boldsymbol{V_1 = \frac{V_0 * (m_0 + m)}{m_0}}$$

$$\boldsymbol{V_1 = \frac{V_0 * (\frac{M_{H_2}}{n} + m)}{\frac{M_{H_2}}{n}} = \frac{V_0(M_{H_2} + \frac{m}{n})}{M_{H_2}} = V_0(1 + \frac{m}{nM_{H_2}})}$$

$$\boldsymbol{V_1 = 434 * \left(1 + \frac{0.129}{0.141*2}\right) = 633 \ cm^3}$$

Answer: $633 \ cm^3$.