Answer on Question #66124 - Chemistry - General Chemistry

Data: Room Temperature: 72 F
Mass of magnesium ribbon: 0.044g
Atmospheric pressure in room: .985 atm
Temp of water in beaker: 23 C
Volume of gas in the tube: 43.60g

1. Use the mass of the magnesium ribbon to find the moles of gas produced using stoichiometry.

2. Change the volume of gas collected to liters.

3. Find the temperature of the gas you collected in kelvin.

4. Convert the atmospheric pressure to Pa.

5. Use the number of moles, the volume, temp, and pressure of the gas that you found above to solve for the experimental gas constant R using the ideal gas law.

Solution:

1. The chemical reaction between magnesium ribbon and water is:

0,044 g x g

$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2\uparrow$

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We can find the moles of gas using chemical reaction. First of all make a proportion:

$\frac{0,044}{24} = \frac{x}{2}$

Where X:

$X = \frac{0,044 \cdot 2}{24} = 0,0037$ (g)

So, the mass of Hydrogen is 0,0037 grams. Now we can calculate the value of number of moles using known mass:

$n\ (H_2) = \frac{m\ (H2)}{M(H2)} = \frac{0,0037}{2} = 0,00185$ (moles)

2. Volume of gas in the tube: 43.60g

Volume of gas in liters is: $V = \frac{m \cdot Vm}{M} = \frac{43,60 \cdot 22,4}{2} = 488,3$ (l)

Using the mass determined 0,0037 grams:

$V = \frac{m \cdot Vm}{M} = \frac{0,0037 \cdot 22,4}{2} = 0,0414$ (l)

3. Room Temperature: 72 F

So, the temperature of gas is: $T = 273 + 22,2^0C = 295,2$ (K)

4. Atmospheric pressure in room: 0.985 atm

Atmospheric pressure in Pascal equals 99805,125.

5. The experimental gas constant R according to the ideal gas law:

pV = nRT,

where R is:

$R = \frac{pV}{nT} = \frac{99805,125 \cdot 0,0414}{0,00185 \cdot 295,2} = 7,57 \cdot 10^3$ (J/kmol·K)

Answer: n (H_2) = 0,00185 (moles); V = 0,0414 (l); T = 295,2 K; p = 99805,125 Pa; $R = 7,57 \cdot 10^3$ J/kmol·K.