Gas Constant

CHMG145 Section 10

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Date of Analysis: November 13, 2020

For this lab, we experimented to determine the Gas Constant, R = 0.08206 l*atm / mol*K. This was done using the formula PV = nRT. All of the values except for R were found, the simple algebra was used to determine the missing value.

To start, we had a setup that included a reaction flask, filter flask, and a collection beaker. The reaction flask was filled with about 30mL of Hydrochloric Acid. A small Magnesium strip was placed inside of that flask and sealed up. The H2 gas that was released was pushed through the tube into the filter flask, that was filled with water. The H2 gas pushed the water into another tube that fed into the collection beaker. The displaced water inside of the collection beaker was used to find the volume and mols of released gas. The temperature was approximated by sticking a thermometer into the filter flask's water. Lastly, the local barometric reading was used as the pressure of the reaction. Plugging the values into the given equation gives us a value for R. This was then done a total of three times. The average, standard deviation, and %RSD were found.

The table below shows the procedural values attained from the experiment. The initial mass of the collection beaker is its mass without any water and the final mass contains the displaced water from the experiment. The pressure of the gas was the atmospheric pressure that was found by the local barometric readings. The volume of the gas was found by turning the displaced water into mL, then turned into mols for the Mols of Gas.

Table 1

	Initial mass of collection beaker (g)	Final mass of collection beaker (g)	Mass of Mg strip (g)	Pressure of Gas (atm)	Volume of Gas (V)	Mols of Gas (M)	Temp of Gas (K)	Calculated Gas Constant (R)
1	129.2	221.1	0.087	1.00033	0.0919	0.0036	293.15	0.0871
2	129.2	225.35	0.102	1.00033	0.09615	0.0042	292.15	0.0784
3	129.2	225.55	0.099	1.00033	0.9635	0.0041	293.15	0.0802

Average R: 0.0819 L*atm / mol * K

Standard Deviation: 0.00375

%RSD: 4.579%

The calculated R-value has a 0.195% difference from the given.

Possible experimental errors:

- Not waiting for the entire Magnesium strip to finish dissolving
- Not getting every last drop of displaced water from the collection beaker
- Not perfectly cleaning out all of the water from the collection beaker between trials