# Answer on Question #53973 – Chemistry – General chemistry

**Question:**

472 mL of $H_2$ was collected was water when 1.256 g Zn reacted with excess HCl. The atmospheric pressure during the experiment was 754 mm Hg and the temperature was 26 degree Celsius.
A.) Use the data from the experiment to calculate the experimental molar mass of zinc in g/mol.
B.) What is the molar mass of zinc from the Periodic Table (known value)? Convert to g/mol
C.) Calculate the percent error for the experimental molar mass of Zn.

**Answer:**

The chemical reaction is shown as:

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

A) First of all, an amount of hydrogen should be found:

The partial water vapor pressure at 26 degree Celsius equals:

$p(H_2O) = \exp(20.386 – 5132/T)$

Thus, $p(H_2O) = \exp(20.386 – 5132/299) = 25.081$ mm Hg

Then the partial pressure of hydrogen equals:

$p(H_2) = 754$ mm Hg - $p(H_2O) = 754$ mm Hg -25.081 mm Hg = 728.919 mm Hg = 0.959104 atm

Using equation for ideal gas, the number of moles for $H_2$ is:

$\mu = (pV)/(RT)$,

where p – the partial pressure of hydrogen which is of 0.959104 atm;

V – the volume of hydrogen;

R- the gas constant being of 0.082057 L atm $K^{-1}$ $mol^{-1}$,

T – the temperature.

So, $\mu = (0.472 \text{ L} \times 0.959104 \text{ atm}) / (0.082057 \text{ L atm K}^{-1} \text{ mol}^{-1} \times 299 \text{ K}) = 0.02$ moles

According to the chemical reaction, numbers of moles for Zn and $H_2$ are the same:

$\mu(Zn) = \mu(H2) = 0.02$ mol

Therefore, the experimental molecular mass of Zn is:

$M_{ex}(Zn) = m(Zn)/0.02 \text{ mol} = 1.256 \text{ g}/0.02 \text{ mol} = 62.8 \text{ g/mol}$

B) According to the data from Periodic Table, the molecular mass of Zn is of 65.37 g/mol

C) As it known the experimental errors can be found:

Absolute error $\Delta = 65.37 \text{ g/mol} – 62.8 \text{ g/mol} = 2.57 \text{ g/mol}$

Relative error $R(\%) = [\Delta/65.37] \times 100\% = [2.57/65.37] \times 100\% = 3.93\ \%$