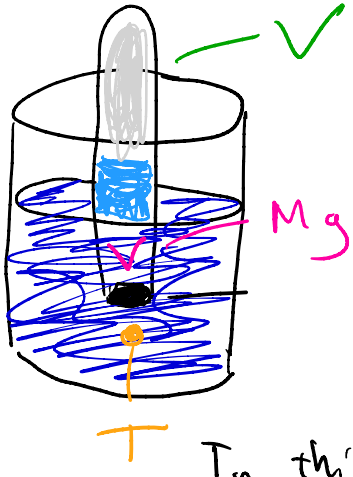
Molar of an ideal gas @ STP



$P_T = P_{H_2} + P_{H_2O} + P_{height}$

Vapor pressure of water
- based on temperature
- can be determined by Equations or from a table

In this example, at the end of the experiment, the liquid level inside the eudiometer is above the level of the liquid outside. This effectively means the pressure outside the eudiometer is greater than inside. This difference is due to the weight of water itself.

$P = phg$ (h: height)

P: pressure, p: density

Pressure is relate to both the height and density of a column of liquid.

density of $H_2O = 1.0\ g/mL$

density of $Hg = 13.6$

Since the density of Hg is 13.6 times that of water, the height of a column of water would have to be 13.6 times higher than a column of mercury in order for there to be the weight of water and therefore related to the same pressure,

1 mm Hg (torr) = 13.6 mm H_2O

$$P_T = P_{H_2} + P_{H_2O} + \frac{\text{height in mm}}{13.6}$$

(torr) (torr)

Example: $P_T = 30.08'' \times \frac{25.4\text{ mm}}{1\text{ in}} = 764.0$

$$764.0 = P_{H_2} + 23.8 + \frac{10.0\text{ mm}}{13.6}$$

corrected pressure of H_2 at ambient conditions

P_1 V_1 — volume in eudiometer

T_1 — temp of solution at stopper

P_2 — 760 torr

V_2 — Adjusted volume produced by the sample of magnesium, V_{adj}

T_2 — 273K

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

↳ To get molar volume, divide by moles.

① $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + ①H_2(g)$

Since HCl is used in excess, Mg(s) is the limiting reagent. Therefore, moles of H_2 produced is equal to the moles of Mg.

$$n_{H_2} = n_{Mg} = \frac{\text{mass of Mg}}{\underbrace{\text{MM of Mg}}_{\text{molar mass}}}$$

$$V_{molar} = V_{adj} / n_{H_2}$$

$$\% \text{ error} = \frac{\text{obtained value} - \text{accepted value}}{\text{accepted value}} \times 100\%$$

Please do not use absolute signs in this equation.

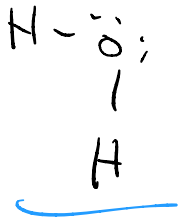
Lab Exercise 1

- only data, calculations, and % error
- all text, tables, etc must be in one document
- Submitted through Canvas

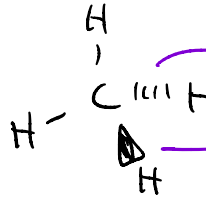
Sec 1 Due 4/27 10:30 AM

H_2O	CH_4	C_2H_6
MM = 18	MM = 16	MM = 30
liquid	gas	gas

Why is water a liquid at 1 atm + 25°C while methane is a gas?

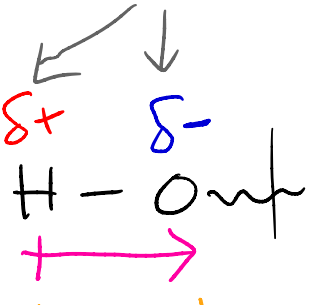


bent → polar



tetrahedral → non-polar

partial



Dipole - charge separation across space

If all the bonds in a tetrahedral structure are equal, the dipoles in those bonds will cancel each other out.

Water has a bent structure, so even if they are equal, the bond dipoles cannot cancel out.

Methane has no molecular dipole, so there are few attractions (inter-molecular forces [IMF]) between molecules, Therefor it takes very little energy to overcome these attractions, so methane is a gas at RT,

Water has a strong molecular dipole, so it takes much more energy to overcome the IMF, so water is a liquid at RT,