10-3-05

CHM 123 - Lecture (Monday 10:30am)

Enthalpies of Formation

- ΔH_f - enthalpy of formation of a compound from its constituent elements.
- Magnitude of ΔH - condition dependent
- standard state - state of substance in pure form at 1 bar and 25°C
  - ΔH_f° - change in enthalpy for reaction that forms 1 mol of compound from its elements (all in standard state).
  - ΔH_f° - of most stable form of any element is 0
    e.g. O_2, C, Na, H_2 ⇒ stable form, $\Delta H_f^\circ = 0$
  - You can use ΔH_f° values to calculate ΔH_{rxn}° for any reaction.
  - $\Delta H_{rxn}^\circ = \sum [n \Delta H_f^\circ (\text{products})] - \sum [n \Delta H_f^\circ (\text{reactants})]$

    n = no. of moles from equation

Gases

Properties of gases:

- (•) expands to fill container.
- compressible. (less dense than liquids & ~~gases~~ solids).
- Fluids

Pressure

$$P = \frac{\text{force}}{\text{Area}} = \frac{F}{A}$$

Ways to measure pressure:

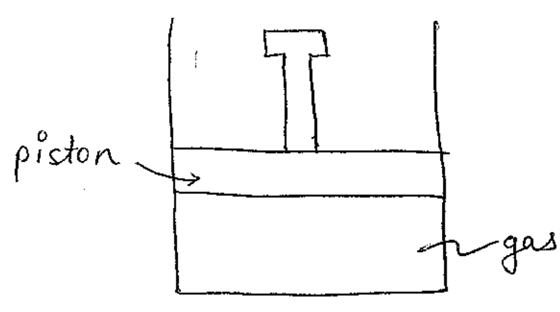
- Mercury Barometer
- Manometer.

SI unit for pressure ⇒ Pascals (Pa)

$$1\ Pa = 1\ kg/ms^2$$

Atmospheric pressure @ sea level:

$\sim 760\ mm\ Hg = 1.01 \times 10^5\ Pa \approx 101\ kPa \approx 1\ atm$ (normal atmospheric pressure).



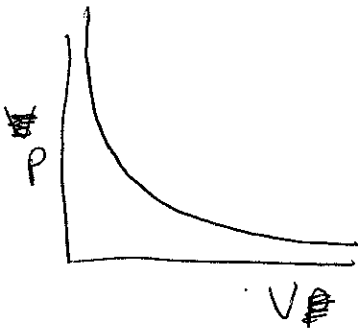
1.0 L
volume ↓
0.25 L

pressure ↑ by factor of 4.

Boyle's Law

Fixed amount of gas at constant T,

$$V \propto \frac{1}{P} \quad , \quad PV = \text{constant}.$$



$PV = \text{constant}$

$P_1V_1 = \text{constant}$ or $P_2V_2 = \text{constant}$

$$\boxed{P_1V_1 = P_2V_2}$$

Charles's Law

Fixed amount of gas at constant P,

$V \propto T$, $V/T = \text{constant}$

$P \propto T$, $P/T = \text{constant}$

} absolute scale of temperature is used (Kelvin scale)

$0°C = 273.15\,K \Rightarrow$ Temperature in Kelvin.

$\frac{V_1}{T_1} = \text{constant}$ & $\frac{V_2}{T_2} = \text{constant}$

So, $\boxed{\frac{V_1}{T_1} = \frac{V_2}{T_2}}$ & $\boxed{\frac{P_1}{T_1} = \frac{P_2}{T_2}}$