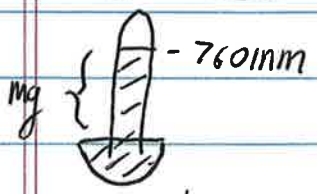
Today: Wednesday Nov 14: start ch 10
Friday 11/16 ch 10 cont
next Monday / Tuesday: no chemistry lecture / lab



barometer

standard pressure = 760 mm Hg = 1 atm = 101.32 kPa

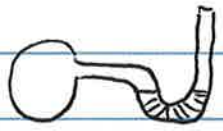
$$\text{pressure} = \frac{\text{force}}{\text{area}} = \frac{m \times a_g}{\text{area}}$$

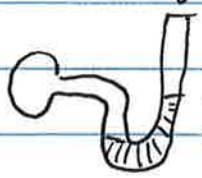
$$P = \frac{1.0328\ \text{kg} \mid 9.81\ \text{m} \mid}{\text{s}^2} \quad \frac{1\ \text{cm}^2}{1\ \text{cm}^2 \mid (1\times10^{-2})^2\ \text{m}^2} = 1.0132\times10^5 \frac{\text{kg}}{\text{s}^2 \cdot \text{m}}$$

pascal (Pa)

$$V = \frac{1\ \text{m}^3 \mid 1^3\ \text{cm}^3 \mid 1\ \text{L}}{1\times10^{-6}\ \text{m}^3 \mid 1000\ \text{cm}^3} = \boxed{1\ \text{m}^3 = 1000\ \text{L}}$$

Manometer


$P_{int} = P_{ext}$



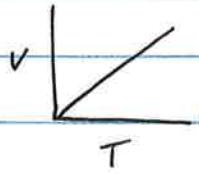
* manometer problems have to be in mm Hg

$P_{int} = P_{ext} + \Delta P$

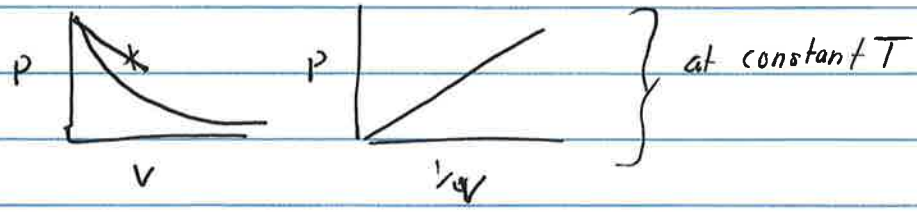
$P_{int} = 760\ \text{mm Hg} + 40\ \text{mm Hg} = 800\ \text{mm Hg}$

Ideal gas law $PV = nRT$ ← in kelvin

Charles's law (at constant P)



Boyle's law



$R = 0.0821$ L·atm / mol k

$R = \frac{8.314 \text{ J}}{\text{mol k}}$

- What is the pressure exerted by 52g O_2 if it occupies 50.0L at 23°C?

$PV = nRT$

$P = \frac{nRT}{V}$

$n = 52\text{g} \left| \frac{\text{mol}}{32\text{g}} \right. = 1.625 \text{ mol}$

$T = 273 + 23 = 296\text{k}$

$V = 50.0\text{L}$

$P = \frac{1.625\text{mol} \left| .0821 \text{ L·atm} \right| 296\text{k} \left| \right.}{\text{mol k} \left| \right. \left| 50.0\text{L} \right.} = 0.79 \text{ atm}$

- At what temperature will 4.00 mol He have in a volume of 45.00L at 850 mmHg

$PV = nRT$

$\frac{PV}{nR} = T$

$P = 850\text{mmHg} \left| \frac{1\text{atm}}{760\text{mmHg}} \right. = 1.12\text{atm}$

$1.12\text{ atm} \left| 45.00\text{L} \right| \left| \frac{\text{mol·k}}{0.0821\text{ L·atm}} \right. = \boxed{153.25\text{ k}}$

$PV = nRT$ $\quad n = \frac{m}{MM}$

$PV = \frac{mRT}{MM}$

$MM = \frac{mRT}{PV}$ $\quad d = \frac{m}{V}$

$MM = \frac{dRT}{P}$

• What is the density of CO_2 (or N_2) at 750 mmHg and 22°C?

CO_2

$\frac{MM \cdot P}{RT} = d$ $\quad MM = 44.01\ g/mol$

$P = \frac{750\ mmHg}{} \left| \frac{1\ atm}{760\ mmHg} \right. = 0.987\ atm$

$T = 22 + 273 = 295\ K$

$\frac{44.01\ g}{mol} \left| \frac{0.987\ atm}{} \right| \frac{mol \cdot K}{0.0821\ L\text{-}atm} \left| \frac{}{295\ K} \right. = \boxed{1.79\ g/L}$

N_2

$MM = 28\ g/mol$

$\frac{28\ g}{mol} \left| \frac{0.987\ atm}{} \right| \frac{mol \cdot K}{0.0821\ L\text{-}atm} \left| \frac{}{295\ K} \right. = \boxed{1.14\ g/L}$

$PV = nRT$

$R = \frac{PV}{nT}$

$\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 V_2}{n_2 T_2}$ } for changes

	1	2
P		
V		
n		
T		

has to be K ↘

1 atm, 273K

· A gas sample occupies 9.4L at STP. What is its volume at 25°C and 740 mmHg

	1	2
P	760 atm	740 mmHg
V	9.4L	
n	/	/
T	273k	273+25 = 298k

$$\frac{PV}{nT} = \frac{PV}{nT}$$

$$\frac{(760\ \text{mmHg})(9.4\text{L})}{(273\text{k})} = \frac{(740\ \text{mmHg})(V)}{(298\text{k})}$$

$$\frac{(760\text{mmHg})(9.4\text{L})(298\text{k})}{(740\text{mmHg})(273\text{k})} = \boxed{10.5\text{L}}$$

$$\frac{P_1 V_1 MM_1}{m_1 T_1} = \frac{P_2 V_2 MM_2}{m_2 T_2}$$

$$\frac{P_1 V_1}{m_1 T_1} = \frac{P_2 V_2}{m_2 T}$$

$$\frac{P_1}{d_1 T_1} = \frac{P_2}{d_2 T_2}$$

· A bicycle tire is inflated to 55 psi at 15°C. What is its pressure at 35°C.

	1	2
P	55psi	
V	/	/
n	/	/
T	288k	308k

$$\frac{PV}{nT} = \frac{PV}{nT}$$

$$\frac{P}{T} = \frac{P}{T}$$

$$\frac{55\text{psi}}{288\text{k}} = \frac{P}{308\text{k}}$$

$$\boxed{P = 58.8\ \text{psi}}$$