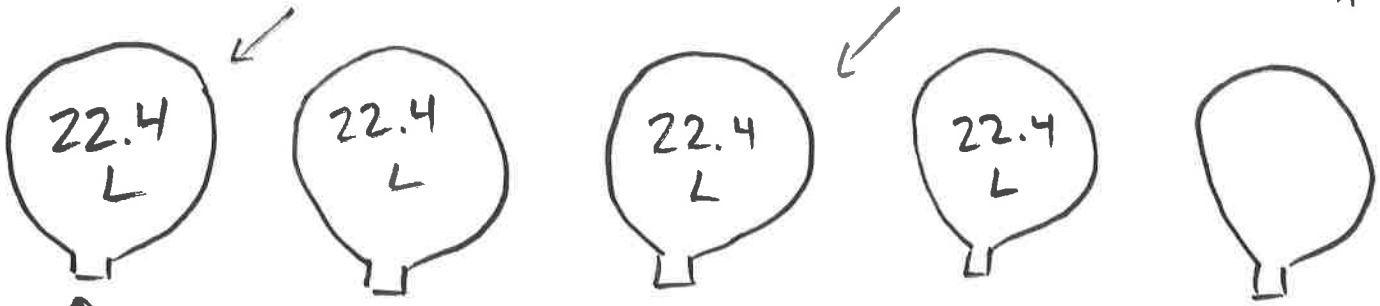
Notes 5-13 - Ideal Gas Law

At STP: 273 K, 1 atm



O_2	N_2	H_2	Ar	NH_3
1 mol	1 mol	1 mol	1 mol	1 mol
(32.00 g)	(28.02 g)	(2.02 g)	(39.95 g)	17.04 g
22.397 L/mol	22.402	22.433	22.397	22.09

Assumption: $\left(\frac{1 \text{ mol any gas at STP}}{22.4 \text{ L}}\right)$

(n)

$$\frac{P \cdot V}{T \cdot n} = \boxed{R} \leftarrow \text{Ideal Gas Constant}$$

$$\frac{(1 \text{ atm})(22.4 \text{ L})}{(273 \text{ K})(1 \text{ mol})} = R = \boxed{0.0821 \ \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}}$$

$$\boxed{PV = nRT}$$

ex) Sample of H_2 gas

Vol = 8.56 L

T = 0. °C = (273 K)

P = 1.5 atm

Find mol H_2

$$n = \frac{P \cdot V}{(R \cdot T)}$$

$$n = \frac{(1.5\ \text{atm})(8.56\ \text{L})}{\left(0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}\right)(273\ \text{K})}$$

$$n = 0.57\ \text{mol}\ H_2$$

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2) Find vol in mL of 0.25 mol O_2 gas + 278K, 1.2 atm

$$PV = nRT$$

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

$$V = \frac{(0.25\ \text{mol})\left(0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}\right)(278\ \text{K})}{1.2\ \text{atm}}$$

$$V = 4.8\ \text{L}\left(\frac{1000\ \text{mL}}{1\ \text{L}}\right)$$

4,800 mL