

Mol (n) of a gas

Combined gas law

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

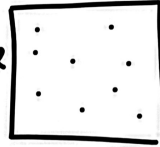
No mol (n) given

Mol is a fixed value (constant)

mol (n) is related to # gas particles.

small # part. large # part

Increase "n"



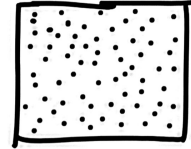
fixed V

fixed T

low n

low P

Increase "P"



same V

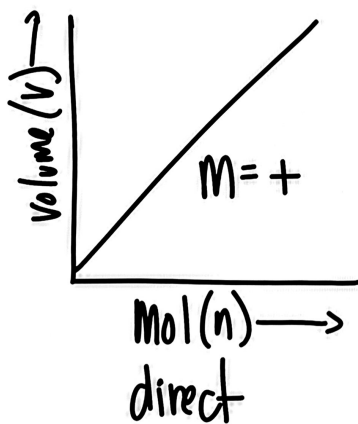
same T

higher n

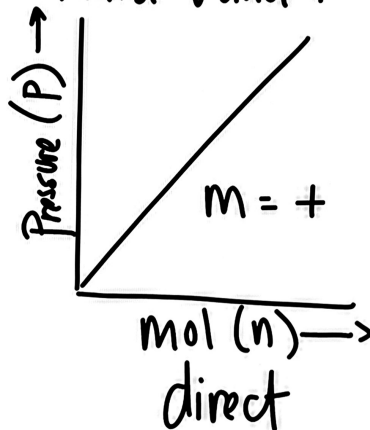
higher P

Fundamental gas laws w/mol (# of particles)

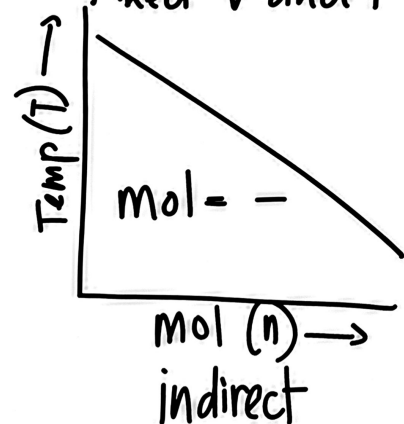
Fixed P and T



Fixed V and T



Fixed V and P



Creating Ideal gas law

Direct $n \uparrow P \uparrow$ $n \uparrow V \uparrow$
[opposite n in eqn]

Indirect $n \uparrow T \downarrow$
[same side in eqn]

Ideal gas law

$$\underbrace{V P}_{\text{direct to } n} = R \underbrace{n T}_{\text{conv. constant to } n}$$

R is called the "ideal gas constant."

R allows comparing P, V, n, T

Ideal gas law

$$R = 0.0821 \cdot \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}$$

$$\begin{array}{ccccccc} P & V & = & n & R & T & \\ \text{atm} & \text{L} & & \text{mol} & & & \text{K} \\ & & & & & \swarrow & \\ & & & & & \text{L} \cdot \text{atm} & \\ & & & & & \text{mol} \cdot \text{K} & \end{array}$$

Base: $P V = n R T$

P: $P = \frac{n R T}{V}$

V: $V = \frac{n R T}{P}$

n: $n = \frac{P V}{R T}$

T: $T = \frac{P V}{n R}$

Ideal gas law example

$$P = 1.48 \text{ atm} \quad V = 32.48 \text{ L}$$

$$n = 2.45 \text{ mol} \quad T = \text{---} \text{ K}$$

$$R = 0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}$$

Base eqn:

$$PV = nRT$$

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

$$T = \frac{1.48 \text{ atm} \cdot 32.48 \text{ L}}{2.45 \text{ mol} \cdot 0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}}$$

$$T = 238.98 \text{ K}$$

...

$$e = \frac{a \cdot b}{c \cdot d} \quad \textcircled{1} \quad a \boxed{\times} b \boxed{=} \boxed{\div} c \boxed{\div} d \boxed{=} \\ \textcircled{2} \quad a \boxed{\times} b \boxed{=} \boxed{\div} c \boxed{\times} d \boxed{=}$$

$$\times a \boxed{\times} b \boxed{=} \boxed{\div} c \boxed{\times} d \boxed{=}$$

wrong! :)