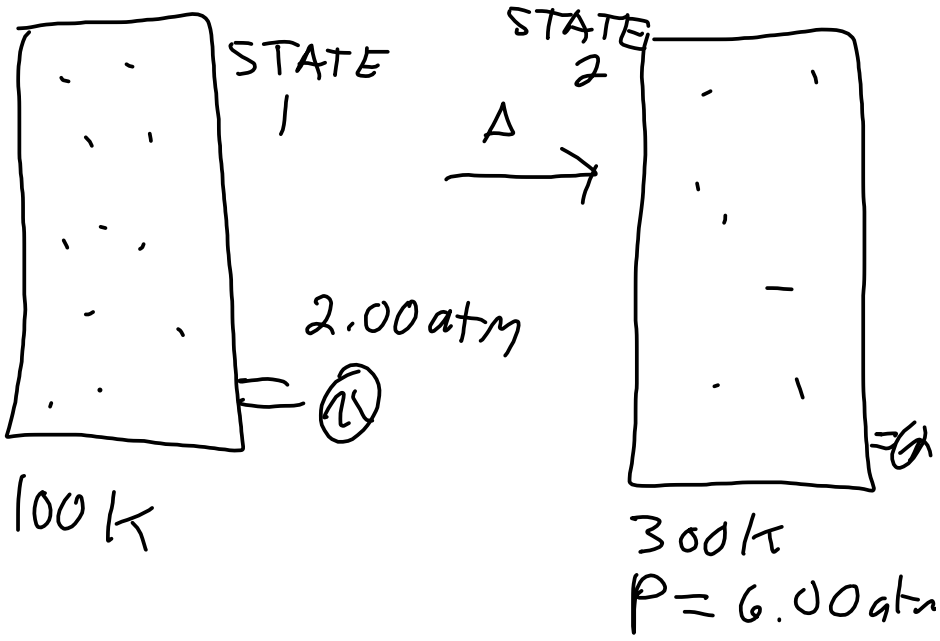

$P \propto T$ Gay-Lussac's Law (Amonton's Law)

$P = kT \quad k = f(V, n)$

$V_1 = V_2$ (isochoric)

$n_1 = n_2$

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

$\frac{P_1}{T_1} = k \qquad \frac{P_2}{T_2} = k$

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

Applies to an isochoric process involving a fixed amount of gas.

2-point form of Gay-Lussac's Law (Amonton's Law)

LAW	2-POINT EQUATION	WHAT MUST BE CONSTANT
Boyle's Law	$P_1 V_1 = P_2 V_2$	T (isothermal) ∩
Charles' Law	$\frac{V_1}{T_1} = \frac{V_2}{T_2}$	P (isobaric) ∩
Gay-Lussac's Law (Amonton's Law)	$\frac{P_1}{T_1} = \frac{P_2}{T_2}$	V (isochoric) ∩
Combined gas law	$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$	∩

$V \propto \frac{1}{P}$ Boyle's Law

$V \propto T$ Charle's Law

$V \propto n$ ✓ ~ Avogadro's Law

$V \not\propto \frac{1}{n}$

$V \propto \frac{1}{P} \cdot T \cdot n$

$V = R \cdot \frac{1}{P} \cdot T \cdot n$

R: gas constant

$PV = RTn$

$\boxed{PV = nRT}$ ideal gas law

$R = \frac{PV}{nT} = 0.08206 \frac{L\,atm}{K\,mol}$

What pressure is exerted by 1.758 g of CH_4 gas in a 4.916 L container at 26.8 °C ?

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

$$MWT_{CH_4} = 1(12.01) + 4(1.008)$$
$$= 12.01 + 4.032$$
$$= 16.042$$

$$1.758\ g\,CH_4 \left(\frac{1\ mol\ CH_4}{16.042\ g\,CH_4} \right) = 0.10959\ mol$$

$$P = \frac{nRT}{V} = \frac{(0.10959\ mol)(0.08206\ \frac{L\,atm}{K\,mol})(299.95\ K)}{4.916\ L}$$
$$= 0.5487\ atm$$

What is the density of O_2 gas when the pressure is 2.753 atm and the temp. is 22.4 °C ?

$$d = \frac{m}{V} = \frac{3.632\,g}{1\,L} = 3.632\,\frac{g}{L}$$

$$PV = nRT \longrightarrow n = \frac{PV}{RT}$$

$$n = \frac{(2.753\ \text{atm})(1\ \text{L})}{(0.08206\ \frac{\text{L atm}}{\text{K mol}})(295.55\ \text{K})}$$

$$= 0.1135\ \text{mol}$$

$$0.1135\ \text{mol}\ O_2 \left(\frac{32.00\ g\ O_2}{1\ \text{mol}\ O_2}\right) = 3.632\ g\ O_2$$