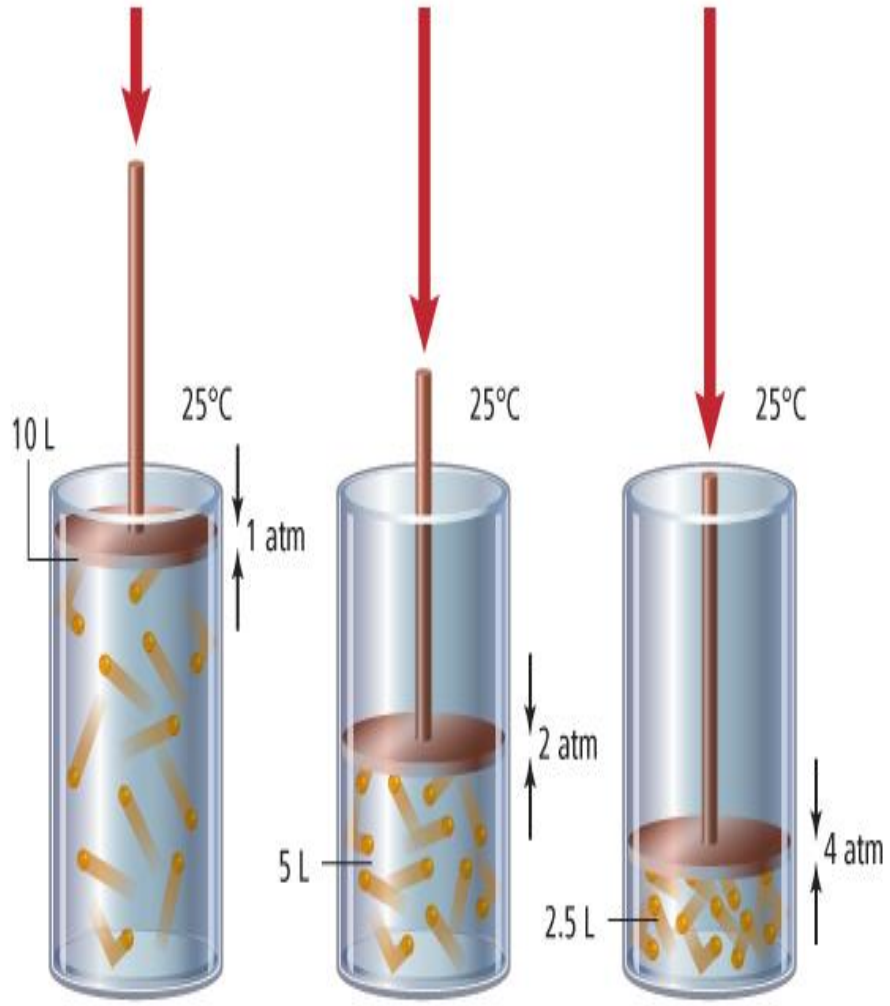
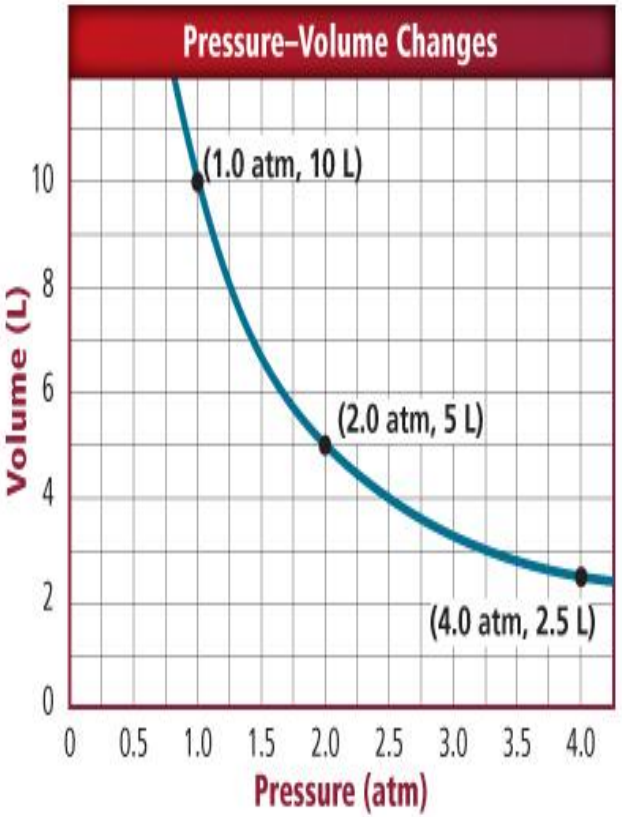
Gas Laws



$P_1V_1 = (1\text{ atm})(10\text{ L})$
$= 10\text{ atm} \cdot \text{L}$
$= \text{constant}$

$P_2V_2 = (2\text{ atm})(5\text{ L})$
$= 10\text{ atm} \cdot \text{L}$
$= \text{constant}$

$P_3V_3 = (4\text{ atm})(2.5\text{ L})$
$= 10\text{ atm} \cdot \text{L}$
$= \text{constant}$



Boyle's Law

- Volume and pressure are inversely related at constant temperature and moles

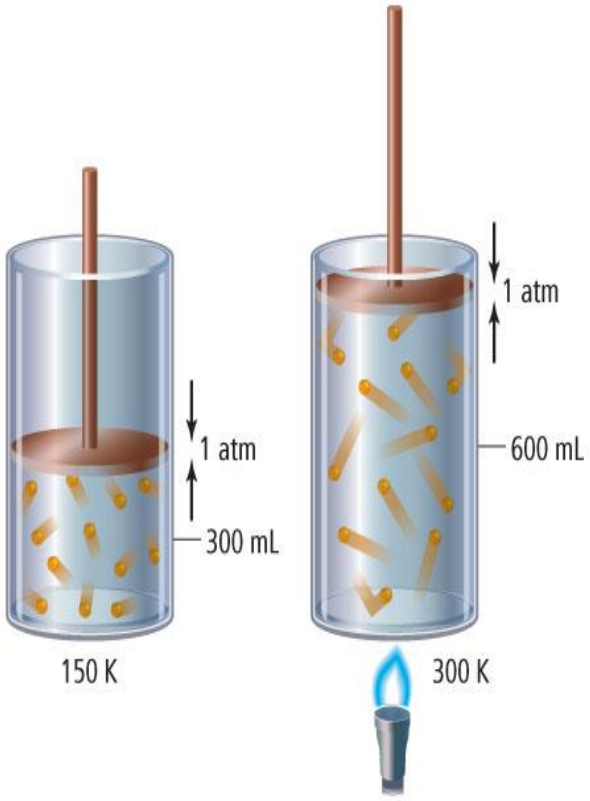
- $P_1V_1 = P_2V_2$ @ constant T, n

Boyle's Law and Kinetic Theory

- If the average speed of the molecules stays the same…
- and the tank volume increases…
- the molecules hit the sides of the container less often.

Absolute Temperature

- Absolute temperature is measured in Kelvins (K)
- One Kelvin is equal in size to one Celsius degree
- $K = {}^{o}C + 273$
- ${}^{o}C = K - 273$



$$\frac{V_1}{T_1} = \frac{300\text{ mL}}{150\text{ K}}$$

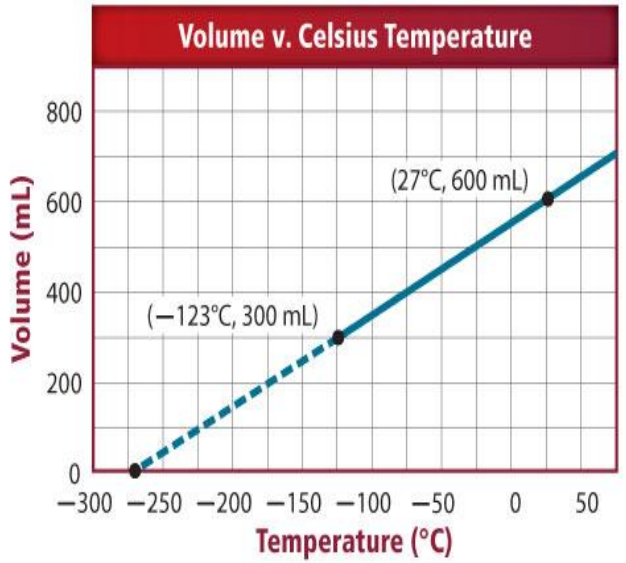
$$= 2\text{ mL/K}$$

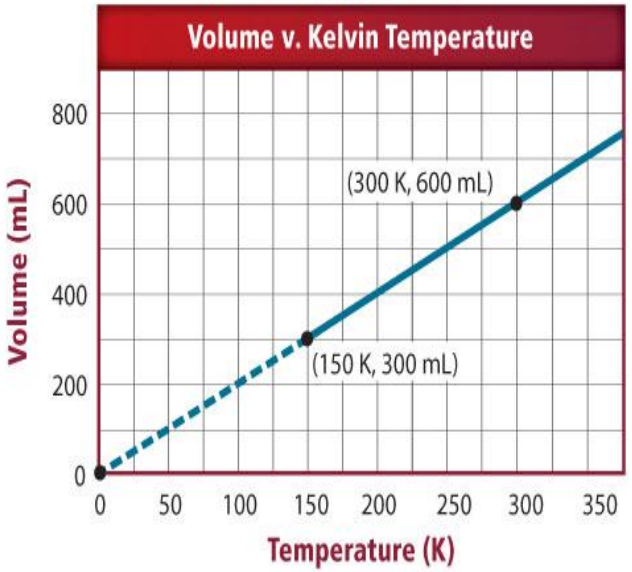
$$= \text{constant}$$

$$\frac{V_2}{T_2} = \frac{600\text{ mL}}{300\text{ K}}$$

$$= 2\text{ mL/K}$$

$$= \text{constant}$$



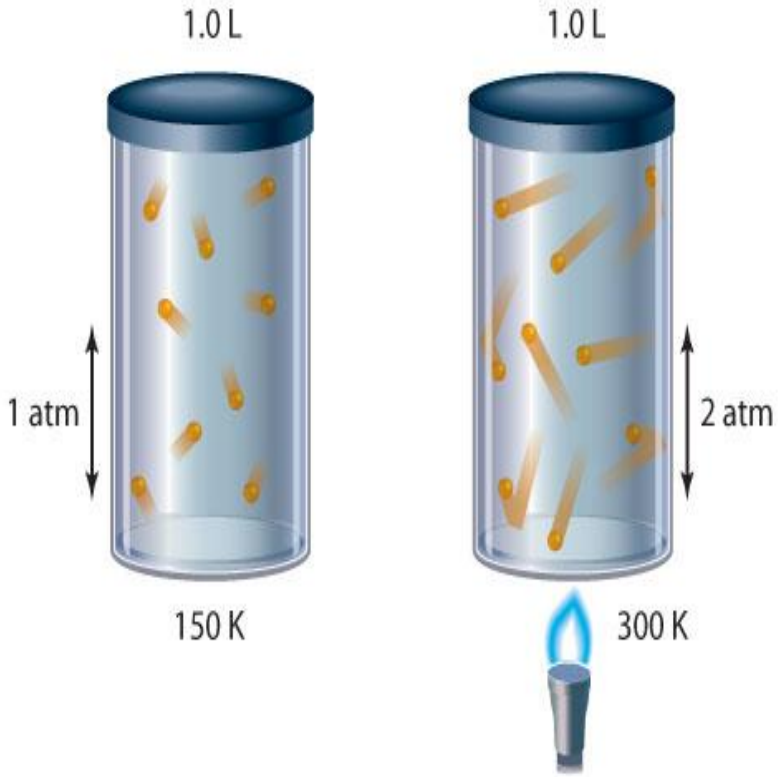


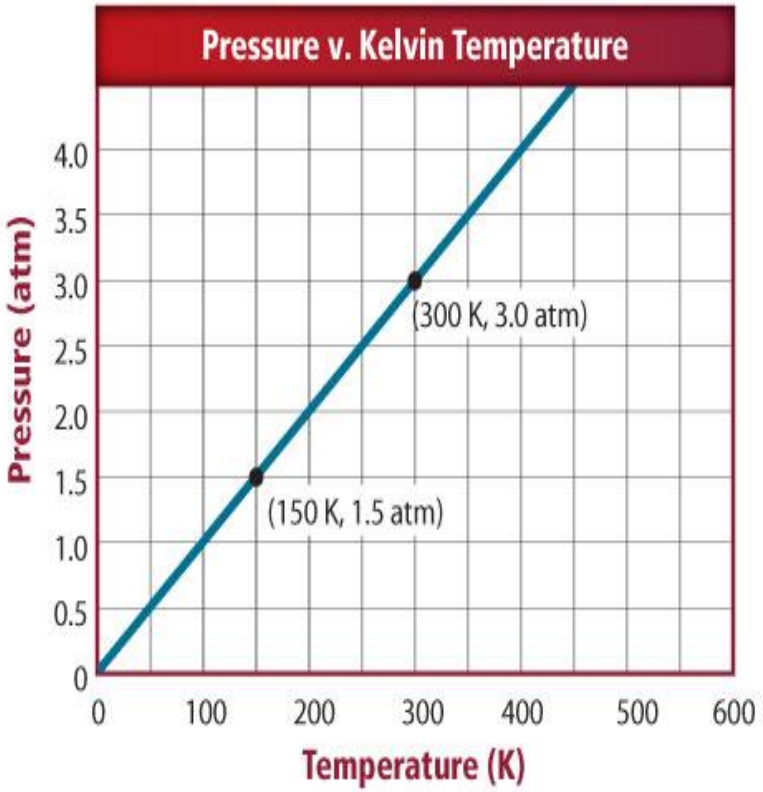
Charles' Law

- Volume and temperature are directly related at constant pressure and moles
- $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ @ constant P, n

Charles' Law and Kinetic Theory

- If the number of collisions stays the same…
- and the tank volume increases…
- the molecules must be moving faster on average.





$$\frac{P_1}{T_1} = \frac{1.5\ \text{atm}}{150\ \text{K}}$$

$$= 0.01\ \text{atm/K}$$

$$= \text{constant}$$

$$\frac{V_2}{T_2} = \frac{3.0\ \text{atm}}{300\ \text{K}}$$

$$= 0.01\ \text{atm/K}$$

$$= \text{constant}$$