Homework #2

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1.23) gas density at STP $\approx 10^{25}\ m^{-3} = \rho$

$1L = 1000\ cm^3 = \frac{1}{1000}\ m^3$

$N = V \cdot \rho = \frac{1}{1000}\ m^3 \cdot 10^{25}\ m^{-3}$

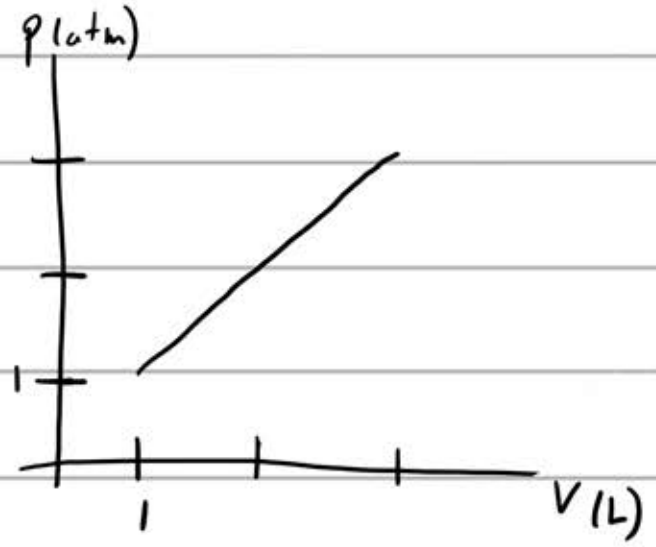
$= 10^{22}$ molecules

$U = \frac{3}{2} NkT$

$= \frac{3}{2} \cdot 10^{22} \cdot 1.38 \times 10^{-23}\ J/K \cdot 300\ K$

$= 62.1\ J$

1.31) (a)



(b) $W = 1atm \cdot 2L + \frac{1}{2} \cdot 2atm \cdot 2L$

$= 4\ atm \cdot L$

(c) $P_1 V_1 = NkT_1$; $N = 10^{22}$

$T_1 = \frac{P_1 V_1}{Nk}$

$= \frac{101325\ Pa \cdot 0.001\ m^3}{10^{22} \cdot 1.38 \times 10^{-23}\ J/K}$

$= 734.239\ K$

$T_2 = \frac{101325\ Pa \cdot 0.001\ m^3}{10^{22} \cdot 1.38 \times 10^{-23}\ J/K} \cdot 9$

$= 6608.15\ K$

$\Delta U = \frac{3}{2} N k \Delta T$