297. 8-17

~~$p = nkT$~~, ~~$\sqrt{\bar{v}^2} = \sqrt{\frac{3kT}{m}} = \sqrt{\frac{3p}{\rho}}$~~

~~$p = \frac{1}{3}nm\bar{v}^2$~~ $\rho = \frac{M}{V} = \frac{Nm}{V}$, $p = \frac{1}{3}nm\bar{v}^2 = \frac{1}{3}\frac{N}{V}m\bar{v}^2$

$\therefore \bar{v}^2 = \frac{3p}{\rho} \Rightarrow \sqrt{\bar{v}^2} = \sqrt{\frac{3p}{\rho}}$

$E = n(t+r+2s)\cdot\frac{1}{2}k_BT = 3n\frac{1}{2}k_BT$

$\sqrt{\bar{v}^2} = \sqrt{\frac{3k_BT}{m}} \Rightarrow T = \frac{m\bar{v}^2}{3k_B}$ $\therefore E = \frac{3}{2}p$

297. 8-18

$(E/V)_A = \frac{3}{2}p$, $(E/V)_B = \frac{5}{2}p$ $\therefore 3:5$

297. 8-20

$pV = nRT = \frac{m}{M}RT \Rightarrow T = \frac{MpV}{mR}$

$\therefore \bar{\varepsilon}_t = \frac{1}{2}k_BT = \frac{MpV}{2mR}k_B = \frac{MpV}{2mN_A}$

297. 8-21

1 mol 单 V_0, p_0	2 mol 双原子 V_0, p_0

(1) $E = \frac{i}{2}V_0p_0 \Rightarrow E_{左} = \frac{3}{2}V_0p_0$, $E_{右} = \frac{5}{2}V_0p_0$

(2) $p_0V_0 = nRT \Rightarrow T_{左} = 2T_{右} = 2T_0$

$T_0 = \frac{1}{2}p_0V_0$

$E_{总} = \frac{i}{2}nN_Ak_BT = \frac{3}{2}\times1\times k_BT + \frac{5}{2}\times2\times k_BT = \frac{13}{2}k_BT$

$= \frac{3}{2}V_0p_0 + \frac{5}{2}V_0p_0 = 4V_0p_0 = \frac{13}{2}k_BT \Rightarrow T = \frac{8V_0p_0}{13k_B} = \frac{8V_0p_0}{13R}$

298. 8-22

$E_1 = \frac{1}{2}(3+3)\cdot nN_Ak_BT = 3nRT$

$E_{O_2} = \frac{1}{2}(3+2)\cdot\frac{1}{2}nN_Ak_BT = \frac{5}{4}nRT$

$E_{H_2} = \frac{1}{2}(3+2)\cdot nN_Ak_BT = \frac{5}{2}nRT$

$\therefore \Delta E = E_{H_2} + E_{O_2} - E_1 = \frac{3}{4}nRT = \frac{1}{4}E_1$, 增加 25%

298. 8-24

~~$n = n_0 e^{-kz} = \frac{3}{4} n_0$~~

$n = n_0 e^{-\frac{mg}{k_B T} z} = \frac{3}{4} n_0 \Rightarrow z = k_B \cdot T \ln\frac{4}{3} / mg$

~~$k_B =$~~ $p = n k_B T$ ∴ $p = \frac{3}{4} p_0$ 时. $n = \frac{3}{4} n_0$

~~$\rho = \frac{m}{V}$~~ $\frac{m}{M} =$ 1mol. ~~$k_B = \frac{R}{N_A}$~~ $N_A \cdot k_B = R$.

∴ $z = T \ln\frac{4}{3} \cdot \frac{R}{Mg} = 2308\text{m}$.