일반물리Ⅰ. Chapter 17

15. $PV = NkT$

(a). $T = 250k$, $P = 1.5atm$, $N = 2mol \times N_A$

$PV = nRT$

$$V = \frac{(2mol)R(250k)}{\underbrace{1.5atm}_{1.515\times10^5 Pa}} = \boxed{\text{약 } 2.9\times10^{-2} m^3}$$

(b).

$$\frac{P_2V_2}{P_1V_1} = \frac{T_2}{T_1} \rightarrow \frac{T_2}{250K} = \frac{4atm}{1.5atm} \cdot \frac{1}{2}$$

$$\boxed{T_2 = 333.33\cdots k}$$

21. $L_s = 393\ kJ/kg$ (고체 → 기체)

$Q = mL_s = (0.255kg)(393\ kJ/kg)$ (기체 → 고체)

$$\boxed{Q = 169.035\ kJ}$$

26. $L = 5000\,km$, $-25^\circ C \rightarrow 40^\circ C$

고체의 선형 차원의 선팽창계수 $\alpha = \frac{\Delta L / L}{\Delta T}$

$\Delta T = 65\,K$, 강철의 $\alpha = 12 \times 10^{-6} K^{-1}$

$\Delta L = \alpha L \Delta T = (12 \times 10^{-6} K^{-1})(5000\,km)(65\,K)$

$\boxed{\Delta L = 3.9\,km}$

36. $20^\circ C \rightarrow 293.15K$, $-10^\circ C \rightarrow 263.15$

$1L = 0.001\,m^3$

$\frac{P_2 V_2}{P_1 V_1} = \frac{T_2}{T_1} \Rightarrow \frac{0.65\,atm}{1\,atm} \cdot \frac{V_2}{8L} = \frac{263.15K}{293.15K}$

$V_2 = \left(\frac{263.15}{293.15}\right)\left(\frac{1}{0.65}\right) \cdot 8L = \boxed{\text{약 } 11L}$

43. $P = \frac{Q}{t}$ [W=J/s] : 열 일률

$2.35\text{kW} \cdot \frac{45}{100} = 1.0575\text{kW}$ (금속을 녹이는데 쓰는 일률)

철 조각에 주망을 뚫는다 = 철 조각을 녹인다. (상변화)

고체 → 액체 상변화, L_f(철) = 268 kJ/kg

$\rho = 7970\ \text{kg/m}^3$

$Q = L_f m = L_f \rho V$

$= (268\ \text{kJ/kg})(7970\ \text{kg/m}^3) \cdot \pi (0.01\text{m})^2 (0.125\text{m})$

$t = \frac{Q}{P} =$ 약 317.3s