1) $n = 6$ mol

$T_i = 24°C = 297°K$ $T_f = ?$

$P_i = P_f$

$W = 1800 J$

$W = p \Delta V$

$V = \dfrac{nRT}{P}$

$W = \cancel{p} \dfrac{nR \Delta T}{\cancel{P}}$

$W = nR[T_2 - T_1]$

$1800 J = 6mol \left(8.314 J/mol·K°\right)\left[T_2 - 297°K\right]$

$\dfrac{1800}{6(8.314)} = T_2 - 297°K$

$T_2 = \dfrac{1800}{6(8.314)} + 297$

$\boxed{T_2 = 335°K = 62.5°C}$

2) $V = 1.4 \, L$

$P = 11 \, mm \text{ of } Hg$

$T = 20°C = 293.18°K$

$R = 62.36 \quad \dfrac{L \cdot mm \, Hg}{mol \cdot K}$

$PV = nRT$

$n = \dfrac{(11 \, mm \, Hg)(1.4 \, L)}{\left(62.36 \dfrac{L \cdot mm \, Hg}{mol \cdot K}\right)(293.18°K)}$

$n = 0.059 \, mol$

3) $n = 0.315$ mol

$T = 22°C = 295.15°K$ $PV = nRT$

$W = -332$ J $P = \dfrac{nRT}{V}$

$W = \displaystyle\int_{V_1}^{V_2} P\, dV$

$W = nRT \displaystyle\int_{N_1}^{V_2} \frac{1}{V}\, dV$

$W = nRT \left[\ln(V_i) - \ln(V_f) \right]$

$W = nRT \left[\ln(P_i) - \ln(P_f) \right]$
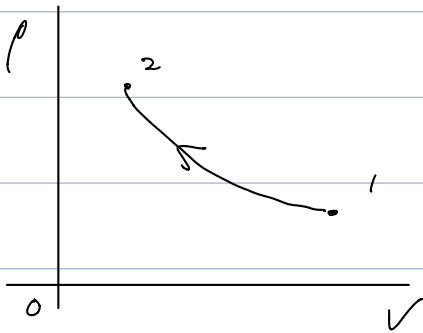
$-332 J = 0.315 \text{ mol} \left(8.314 \dfrac{J}{mol \cdot k°} \right) (295.15°K) \left[\ln(P_i) - \ln(1.76\, atm) \right]$

$\dfrac{-332}{0.315\,(8.314)(295.15)} = \ln(P_i) - \ln(1.76)$

$0.429 + \ln(1.76) = \ln(P_i)$

$0.135 = \ln(P_i)$

$P_i = e^{0.135}$

$P_i = 1.15\, atm$

4) $T_i = 142°C = 415.15°K$

$\Delta Q = 1600 J$

$\qquad U = \Delta Q - W$

$W = 2200 J$

$\qquad U = \dfrac{3}{2} nR \, \Delta T$

$n = 5 mol$

$R = 8.314 \; J/mol \cdot K°$

$U = \dfrac{3}{2} nR \, \Delta T$

$U = \dfrac{3 (5 mol)(8.314 \; J/mol \cdot K°)(T_f - 142°C)}{2}$

$1600 J - 2200 J = \dfrac{3(5 mol)(8.314)(T_f - 142°C)}{2}$

$\dfrac{2(1600 J - 2200 J)}{3(5 mol)(8.314)} + 142 = T_f$

$\boxed{T_f = 132.8°C}$

5) $W = P\Delta V$

$P = 2.00 \, atm = 2.026 \times 10^5 \, Pa$

$V_f = 0.824 \, m^3$

$V_i = 1.00 \times 10^{-3} \, m^3$

a)

$W = 2.026 \times 10^5 \left(0.824 \, m^3 - 1.00 \times 10^{-3} \, m^3 \right)$

$\boxed{W = 166{,}780 \, J}$

b) $\Delta U = Q - W$

$Q = mc$

$Q = 1 \, kg \left(2.2 \times 10^6 \, J/kg \right)$

$Q = 2.2 \times 10^6 \, J$

$\Delta U = 2.2 \times 10^6 \, J - 1.66 \times 10^5 \, J$

$\boxed{\Delta U = 2{,}033{,}219 \, J}$