2(a). $PV = mRT$

$(160)(2) = m(0.2870)(273.15 + 200)$

$m = \dfrac{2 \cdot 160}{0.2870 \cdot 973.15} = 1.1457 \text{ kg}$

0.2870

(b) $P_1 V_1^{1.4} = (160)(2)^2 = 640$

$640 = P_2 (V_2)^2 \Rightarrow V_2 = \sqrt{\dfrac{640}{90}} = 2.6667 \text{ m}^3$

$PV = mRT$

$(90)(2.667) = (1.1457)(0.2870)(T)$

$T_2 = 729.90 \text{ K}$

(c) Boundary work ~~for an ideal gas~~

$= \dfrac{P_2 V_2 - P_1 V_1}{1-n} = \dfrac{(90)(2.667) - (160)(2)}{1-1.4}$

$= 199.99 \text{ kJ}$

(d) $E_{in} = E_{out} + \Delta E$

$Q_{in} + W_{in} = \cancel{W_{out}} + Q_{out} + \Delta U$

$W_{in} = \Delta Q + \Delta U$

$199.99 = \Delta Q + \Delta U$

$199.99 + 200.44 = \Delta Q$

$400.43 = \Delta Q$

400.43 kJ was transfered into the gas in heat.

Avg Temp $= \dfrac{729.90 + (273.15 + 200)}{2}$

$\approx 850 \text{ K}$

$\Delta U = c_v \Delta T$

$c_v = \dfrac{0.834 + 0.812}{2} = 0.824.$

$\Delta U = 0.824 \cdot (729.90 - (273.15 + 200))$

$= -200.44 \text{ kJ}$