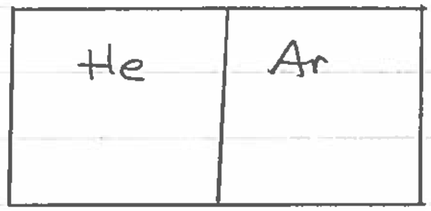

$V_{He} = 100\ cm^3$
$= 100 \times 10^{-6} m^3$

$T_{He} = 100°C = 373K$

$P_{He} = 2\ atm$

(monatomic)

$V_A = 200\ cm^3$
$= 200 \times 10^{-6} m^3$

$T_A = 400°C = 673K$

$P_A = 4\ atm$

(monatomic)

moles: $PV = nRT$

So $n_{He} = \frac{P_{He} V_{He}}{R T_{He}} = 6.536 \times 10^{-3}$ mol

$n_A = \frac{P_A V_A}{R T_A} = 1.449 \times 10^{-2}$ mol

a.) $E = n C_v T$ $\qquad C_v = \frac{3}{2} R$

$E_{He} = \frac{3}{2} n_{He} R T_{He} = \underline{30.39\ J}$

$E_A = \frac{3}{2} n_A R T_A = \underline{121.6\ J}$

$E_{TOT} = E_{He} + E_A = \underline{151.9\ J}$

or, use:

$E_{th} = n C_v T = \frac{3}{2} nRT = \frac{3}{2} PV$

d.) First, total energy is constant
So:

$$E_{TOT} = \frac{3}{2} n_{He} R T_f + \frac{3}{2} n_A R T_f$$

and

$$T_f = \frac{E_{TOT}}{\frac{3}{2} R (n_{He} + n_A)} = \underline{579.7\ K}$$

b.) $E_{He_f} = \frac{3}{2} n_{He} R T_f = \underline{47.23}\ J$

$E_{A_f} = \frac{3}{2} n_A R T_f = \underline{104.7}\ J$

c.) <u>He</u>: $Q = \Delta E = E_{He_f} - E_{He} = 16.84\ J$ flows in.

<u>Ar</u>: $Q = \Delta E = E_{A_f} - E_A = -16.9\ J$ flows out.

Slight difference is due to round-off error.