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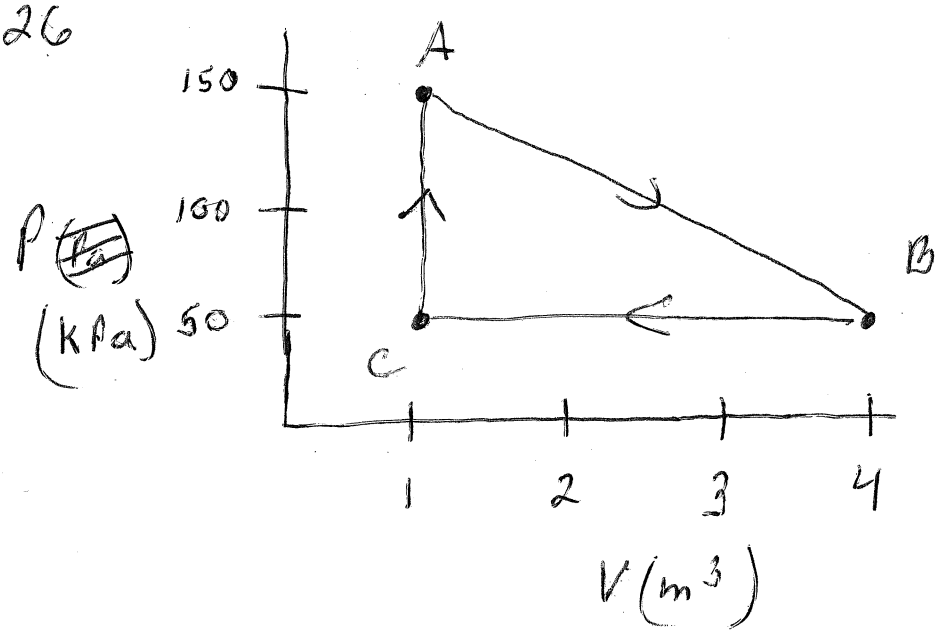

$n = 57.5\,mol$

(1) Calculate the temperature at A, B, C.

(2) Calculate Q_{A-B}, Q_{B-C}, Q_{C-A}

(1)

$PV = nRT$

$T = \frac{PV}{nR} =$

$T_A = \frac{(150\,E3\,Pa)(1\,m^3)}{57.5\,mol\left(8.31\,\frac{J}{mol\,K}\right)}$

$= \boxed{314\,K}$

$$T_B = \frac{(50\,E3\,Pa)(4\,m^3)}{57.5\,mol\left(8.31\,\frac{J}{mol\,K}\right)} = \boxed{419\,K}$$

$$T_C = \frac{(50\,E3\,Pa)(1\,m^3)}{57.5\,mol\left(8.31\,\frac{J}{mol\,K}\right)} = \boxed{105\,K}$$

(2)

$$\Delta U = \Delta Q + W$$

$$\Delta Q = \Delta U - W$$

~~A → B~~

$$U_A = \frac{3}{2}nRT = \frac{3}{2}(57.5\,mol)\left(8.31\,\frac{J}{mol\,K}\right)(314\,K)$$

$$= 2.25\,E5\,J$$

$$U_B = \frac{3}{2}nRT = \frac{3}{2}(57.5\,mol)\left(8.31\,\frac{J}{mol\,K}\right)419\,K$$

$$= 3.00\,E5\,J$$

$$U_C = \frac{3}{2} nRT = \frac{3}{2}\left(57.5 mol\right)\left(8.31 \frac{J}{mol\,K}\right) 105 K$$

$$= 7.53E4\ J$$

Q $A \rightarrow B$

$$\Delta U_{AB} = U_B - U_A = 3.00E5\ J - 2.25E5 J = 7.5E4 J$$

$$W_{AB} = -\frac{1}{2}\left(100 Pa\right)\left(3 m^3\right) + -50 pa\left(3 m^3\right) = -300 J$$

$$\Delta Q_{A\rightarrow B} = \Delta U_{A\rightarrow B} - W_{A\rightarrow B}$$

$$= 7.5E4 J - \left(-300 J\right) = \boxed{7.53E4 J}$$

Q_{B-C}

$$\Delta U_{BC} = U_C - U_B = 7.53E4\,J - 3.00E5\,J$$

$$= -2.25E5\,J$$

$$W_{BC} = (50\,Pa)(3\,m^3) = 150\,J$$

$$\Delta Q_{BC} = \Delta U_{BC} - W_{BC}$$

$$= -2.25E5\,J - 150\,J$$

$$= \boxed{-2.2515\ E5\,J}$$

Q_{CA}

$$\Delta U_{CA} = 2.25E5J - 7.53E4J = 1.50E5J$$

$$W_{CA} = 0$$

$$\Delta Q_{CA} = 1.50E5J - 0J = \boxed{1.50E5J}$$