**3** A fixed mass of gas has an initial volume of $5.00 \times 10^{-4}\,m^3$ at a pressure of $2.40 \times 10^5\,Pa$ and a temperature of 288 K. It is heated at constant pressure so that, in its final state, the volume is $14.5 \times 10^{-4}\,m^3$ at a temperature of 835 K, as illustrated in Fig. 3.1.

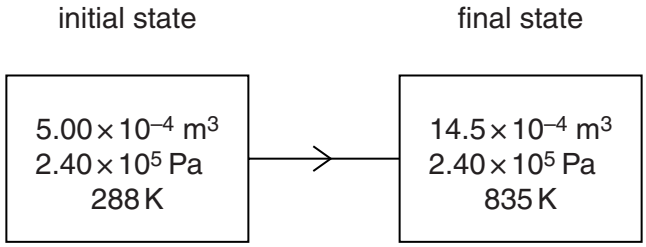


**Fig. 3.1**

**(a)** Show that these two states provide evidence that the gas behaves as an ideal gas.

[3]

**(b)** The total thermal energy supplied to the gas for this change is 569 J.

Determine

**(i)** the external work done,

work done = ..... J [2]

**(ii)** the change in internal energy of the gas. State whether the change is an increase or a decrease in internal energy.

change in internal energy = ..... J

..... [2]