2 An ideal gas initially has pressure 1.0×10^5 Pa, volume 4.0×10^{-4} m^3 and temperature 300 K, as illustrated in Fig. 2.1.

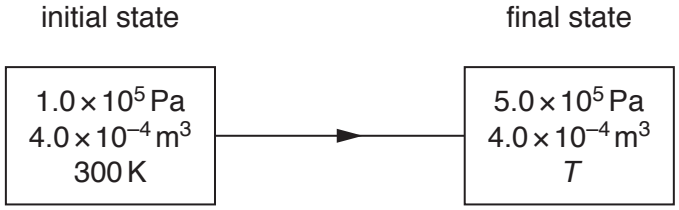

Fig. 2.1

A change in energy of the gas of 240 J results in an increase of pressure to a final value of 5.0×10^5 Pa at constant volume.
The thermodynamic temperature becomes T.

(a) Calculate

(i) the temperature T,

T = ... K [2]

(ii) the amount of gas.

amount = ... mol [2]

(b) The increase in internal energy ΔU of a system may be represented by the expression

$$\Delta U = q + w.$$

(i) State what is meant by the symbol

1. $+q$,

.....

2. $+w$.

.....

[2]

(ii) State, for the gas in **(a)**, the value of

1. ΔU,

ΔU = ... J

2. $+q$,

$+q$ = ... J

3. $+w$.

$+w$ = ... J

[3]

[Total: 9]