2 **(a)** Use one of the assumptions of the kinetic theory of gases to explain why the potential energy of the molecules of an ideal gas is zero.

.....

.....[1]

(b) The average translational kinetic energy E_K of a molecule of an ideal gas is given by the expression

$$E_K = \frac{1}{2}m\langle c^2\rangle = \frac{3}{2}kT$$

where m is the mass of a molecule and k is the Boltzmann constant.

State the meaning of the symbol

(i) $\langle c^2\rangle$,

.....[1]

(ii) T.

.....[1]

(c) A cylinder of constant volume $4.7 \times 10^4\,\text{cm}^3$ contains an ideal gas at pressure $2.6 \times 10^5\,\text{Pa}$ and temperature 173 °C.

The gas is heated. The thermal energy transferred to the gas is 2900 J. The final temperature and pressure of the gas are T and p, as illustrated in Fig. 2.1.

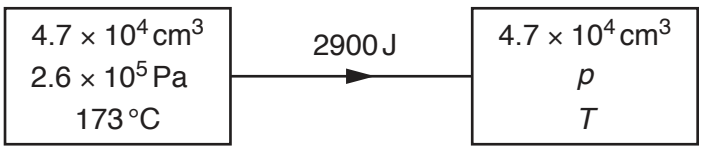

Fig. 2.1

(i) Calculate

1. the number N of molecules in the cylinder,

N = ...[3]

2. the increase in average kinetic energy of a molecule during the heating process.

increase = ... J [1]

(ii) Use your answer in **(i) part 2** to determine the final temperature T, in kelvin, of the gas in the cylinder.

T = ... K [3]

[Total: 10]