2 **(a)** Smoke particles are suspended in still air. Brownian motion of the smoke particles is seen through a microscope.

Describe:

(i) what is seen through the microscope

.....

..... [1]

(ii) how Brownian motion provides evidence for the nature of the movement of gas molecules.

.....

.....

..... [2]

(b) A fixed mass of an ideal gas has volume $2.40 \times 10^3\,cm^3$ at pressure $3.51 \times 10^5\,Pa$ and temperature 290 K. The gas is heated at constant volume until the temperature is 310 K at pressure $3.75 \times 10^5\,Pa$, as illustrated in Fig. 2.1.

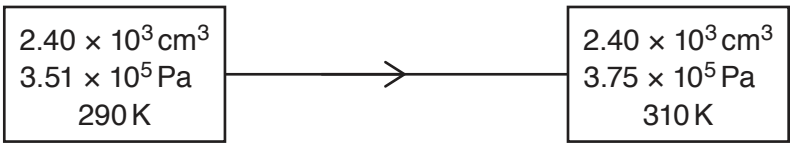

Fig. 2.1

The quantity of thermal energy required to raise the temperature of 1.00 mol of the gas by 1.00 K at constant volume is 12.5 J.

Calculate, to three significant figures:

(i) the amount, in mol, of the gas

amount = ... mol [3]

(ii) the thermal energy transfer during the change.

energy transfer = ... J [2]

(c) For the change in the gas in **(b)**, state:

(i) the quantity of external work done on the gas

work done = ... J [1]

(ii) the change in internal energy, with the direction of this change.

change = ... J

direction .....
[2]

[Total: 11]