3 **(a)** State what is meant by the *internal energy* of an ideal gas.

.....

.....

..... [2]

(b) A fixed mass of an ideal gas has a volume of $3.2 \times 10^{-3}\,m^3$ at a pressure of $1.0 \times 10^5\,Pa$ and a temperature of 12 °C.
The gas is heated at constant pressure so that its volume increases to $3.6 \times 10^{-3}\,m^3$ at temperature θ, as shown in Fig. 3.1.

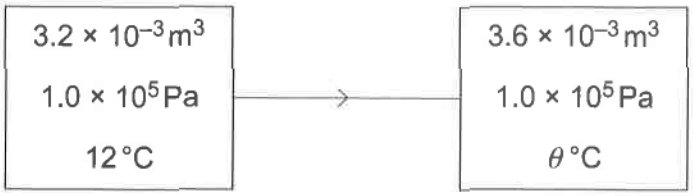

Fig. 3.1

(i) Calculate the final temperature θ, in degrees Celsius, of the gas.

θ = ... °C [2]

(ii) Determine the work done against the atmosphere during the expansion of the gas.

work done = ... J [2]

(c) During the heating process in **(b)**, 101 J of thermal energy is supplied to the gas. For this heating process:

(i) use your answer in **(b)(ii)** to determine the increase in internal energy of the gas

increase = ... J [1]

(ii) calculate the average increase in kinetic energy of a molecule of the gas.

increase = ... J [3]

[Total: 10]