For Examiner's Use

4 A cylinder that contains a fixed amount of an ideal gas is shown in Fig. 4.1.

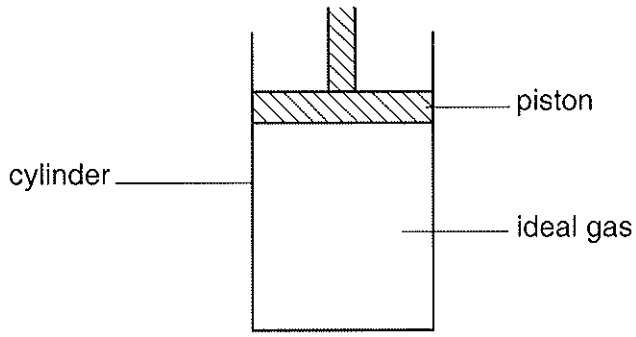

Fig. 4.1

The cylinder is fitted with a piston that moves freely.

(a) Explain how the molecules of the gas produce a force on the piston when they collide with it.

.....

.....

.....[2]

(b) The gas in the cylinder has a volume of $1.6 \times 10^{-3}\,m^3$ at a temperature of 30 °C. The gas is heated to a temperature of 90 °C and expands under a constant pressure of 1.1×10^5 Pa.

(i) Explain, in terms of the force produced by the molecules of the gas, how the pressure remains constant as the volume increases.

.....

.....

.....

.....

.....[3]

(ii) Calculate the volume of the gas at 90 °C.

volume = ... m^3 [2]

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(iii) Calculate the work done by the gas.

work done = ... J [1]

(c) Apply the first law of thermodynamics to give a word equation that describes the process in **(b)**.

[2]