4 Fig. 4.1 shows a fixed mass of ideal gas in a cylinder of pressure 2.1×10^5 Pa, volume 4.0×10^{-4} m^3 and temperature 27 °C.

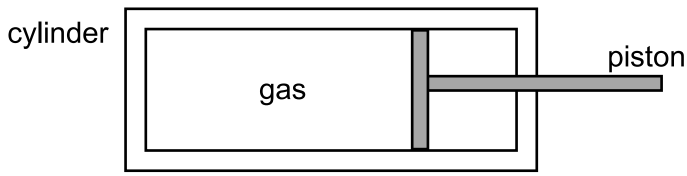

Fig. 4.1

The gas is compressed at constant temperature along process I. Fig. 4.2 shows the variation with volume V of the pressure P of the gas.

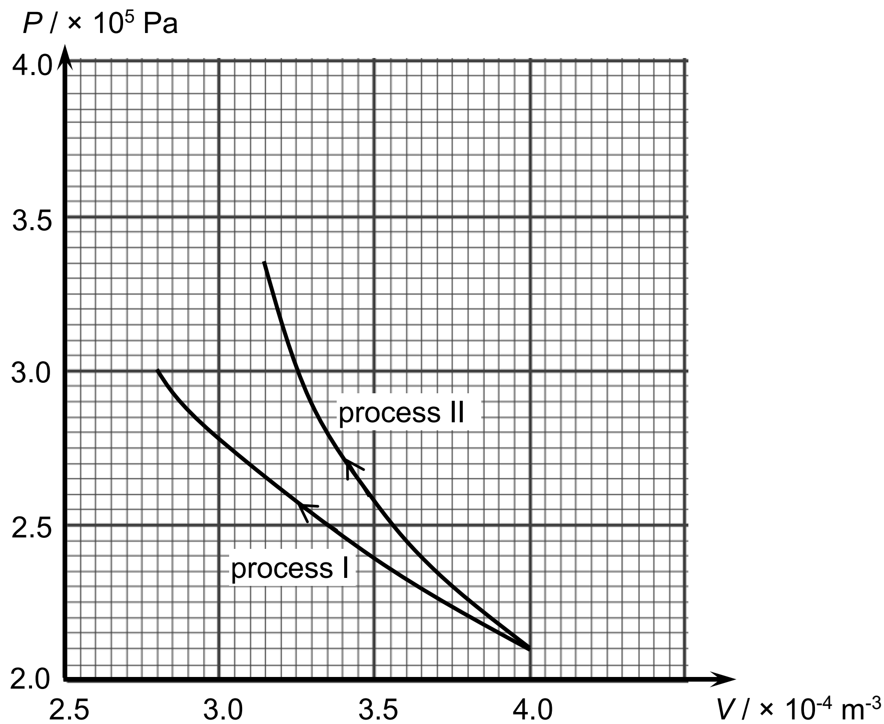

Fig. 4.2

(a) **(i)** With reference to Fig. 4.2, estimate the work done on the gas through process I.

work done = ... J [3]

(ii) State the *first law of thermodynamics*.

....

....[1]

(ii) Determine the heat loss from the gas through process I.

....

....[1]

(b) A second identical cylinder containing the same ideal gas is thermally insulated. The gas is compressed to a new pressure and volume, as shown in process II. The work done on the gas in process I equals to the work done on the gas in process II.

(i) Using the kinetic theory of gases, explain why the pressure in process II increases.

....

....

....

....

....[4]

(ii) Calculate the final temperature of process II.

temperature = ... °C [2]

[Total: 11]