1

(a)

0.050 moles of ideal gas is contained in a cylinder fitted with a piston. The piston moves slowly outwards, resulting in the variation of pressure shown in Fig. 1.1.

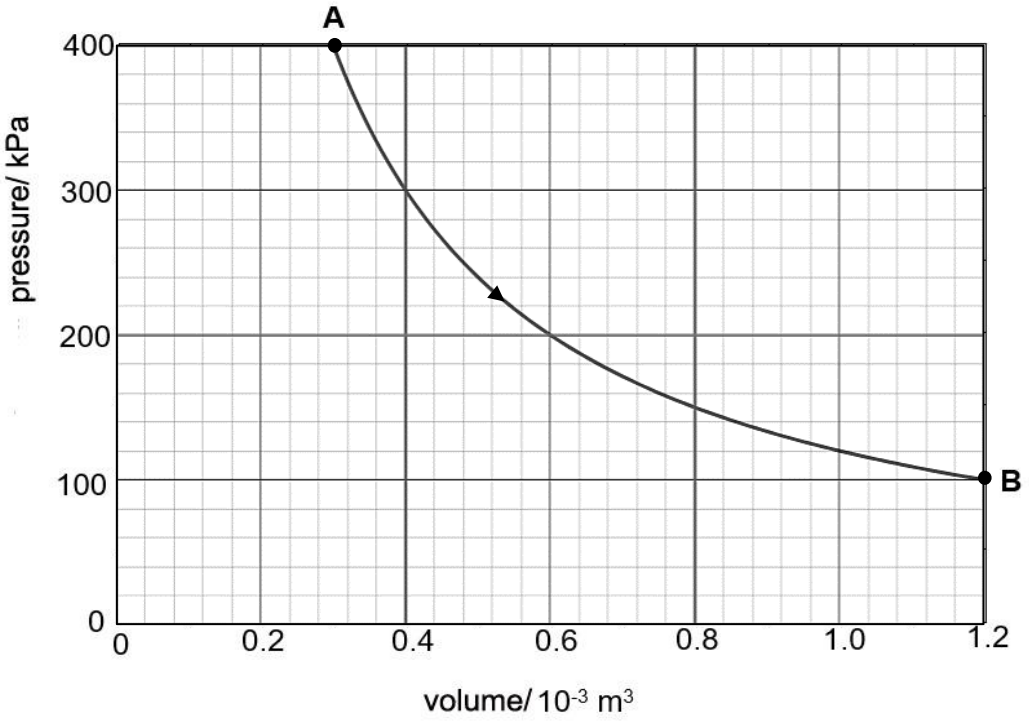

Fig. 1.1

(i)

The temperature of the gas does not change from A to B.

Calculate this temperature.

temperature =

K

[2]

(ii)

Calculate the total kinetic energy of the gas molecules in the cylinder.

kinetic energy =

J

[1]

(iii)

Estimate the amount of work done by the gas as it expands from A to B.

work done =

J

[2]

(iv)

State and explain, using the first law of thermodynamics, whether heat flows into the gas during the process from A to B.

[2]

(b)

An experiment is conducted to investigate how gas pressure varies with temperature.

Two identical sealed glass flasks P and Q are filled with the same amount of ideal gas at the same atmospheric pressure initially. Both flasks are heated from 27°C to 157°C. The pressure in flask P increases as expected, but the pressure in flask Q remains unchanged because some gas leak out of flask Q.

Calculate the ratio

$$\frac{\text{amount of gas in flask Q}}{\text{amount of gas in flask P}} \text{ at 157°C.}$$

ratio =

[3]

[Total: 10]