

4 (a) State the value of absolute zero on:

(i) the Celsius temperature scale

temperature = °C [1]

(ii) the thermodynamic temperature scale. Give a unit with your answer.

temperature = unit [1]

(b) A sample contains a fixed amount of gas. The gas has pressure p , volume V and thermodynamic temperature T .

Fig. 4.1 shows the variation of pV with kT for the sample, where k is the Boltzmann constant.

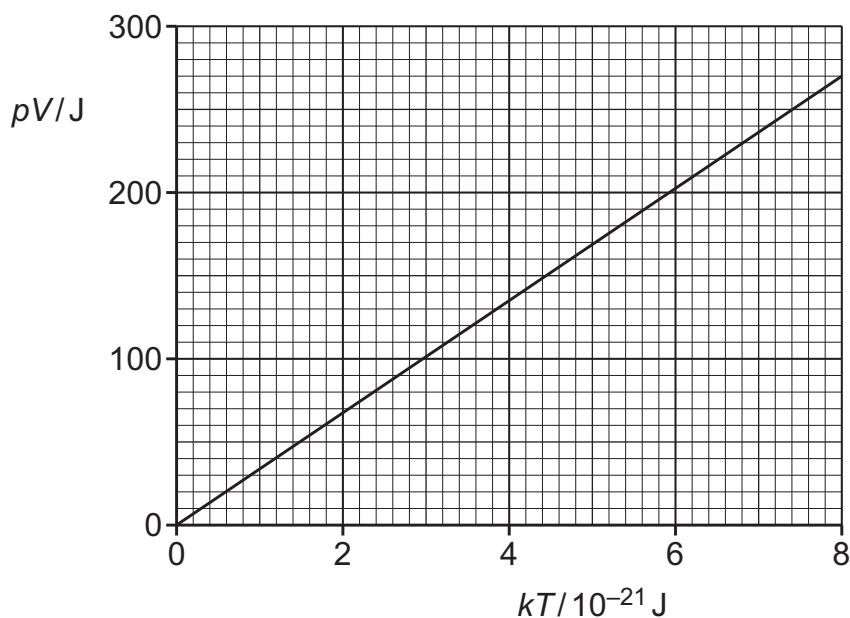


Fig. 4.1

(i) State what is indicated about the nature of the gas from the variation shown in Fig. 4.1.

..... [1]

(ii) Determine the number N of molecules of the gas in the sample.

$N =$ [2]

(iii) Use your answer in (b)(ii) to determine the amount n of gas in the sample.

$n =$ mol [1]

(c) The root-mean-square (r.m.s.) speed of the molecules of the gas is 1900 m s^{-1} when pV is equal to 270 J .

Determine the mass, in u , of one molecule of the gas, where u is the unified atomic mass unit.

mass = u [4]