4 **(a)** The equation of state for an ideal gas may be written as

$$pVA = NBT$$

where p is the pressure of the gas, V is the volume of the gas, A is the Avogadro constant, B is another constant and N is the number of molecules of the gas.

(i) State the meaning, in the equation, of the symbol T.

.... [1]

(ii) Identify the constant B.

.... [1]

(b) The product pV for an ideal gas is also given by

$$pV = \frac{1}{3}Nm\langle c^2\rangle.$$

(i) State the meanings, in this equation, of the symbols m and $\langle c^2\rangle$.

m: ....

$\langle c^2\rangle$: ....
[2]

(ii) Use the equations in **(a)** and **(b)** to derive an expression, in terms of A, B and T, for the mean kinetic energy E_K of a molecule of the gas.

$E_K = $ .... [2]

(c) On Fig. 4.1, sketch the variation with *T* of the root-mean-square (r.m.s.) speed of the molecules of an ideal gas.
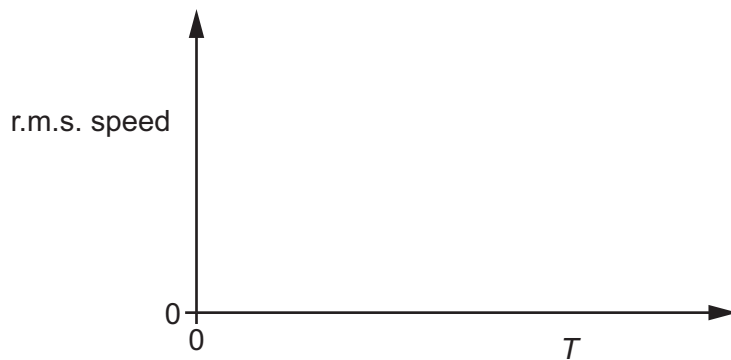

Fig. 4.1

[2]

[Total: 8]