Section A

For Examiner's Use

Answer **all** the questions in the spaces provided.

1 An ideal gas has volume V and pressure p. For this gas, the product pV is given by the expression

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

where m is the mass of a molecule of the gas.

(a) State the meaning of the symbol

(i) N,

.....[1]

(ii) $\langle c^2\rangle$.

.....[1]

(b) A gas cylinder of volume $2.1 \times 10^4\,\text{cm}^3$ contains helium-4 gas at pressure 6.1×10^5 Pa and temperature 12 °C. Helium-4 may be assumed to be an ideal gas.

(i) Determine, for the helium gas,

1. the amount, in mol,

amount = ... mol [3]

2. the number of atoms.

number = ...[2]

(ii) Calculate the root-mean-square (r.m.s.) speed of the helium atoms.

For Examiner's Use

r.m.s. speed = ... $m\,s^{-1}$ [3]