2 The pressure p of an ideal gas having density ρ is given by the expression

$$p = \frac{1}{3}\rho\langle c^2\rangle.$$

(a) State what is meant by:

(i) an ideal gas

.....

.....

..... [2]

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

.....

..... [1]

(b) A cylinder contains a fixed mass of a gas at a temperature of 120 °C. The gas has a volume of $6.8 \times 10^{-3}\,m^3$ at a pressure 2.4×10^5 Pa.

(i) Assuming the gas acts like an ideal gas, show that the number of atoms of gas in the cylinder is 3.0×10^{23}.

[3]

(ii) Each atom of the gas, assumed to be a sphere, has a radius of 3.2×10^{-11} m.

Use the answer in **(i)** to estimate the actual volume occupied by the gas atoms.

volume = ... m^3 [2]

(iii) One of the assumptions of the kinetic theory of gases is related to the volume of the atoms.
State this assumption. Explain whether your answer in **(ii)** is consistent with this assumption.

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..... [2]

[Total: 10]