2 (a) An ideal gas is said to consist of molecules that are hard elastic identical spheres.

State two further assumptions of the kinetic theory of gases.

1. ....

....

2. ....

....
[2]

(b) The number of molecules per unit volume in an ideal gas is *n*.

If it is assumed that all the molecules are moving with speed *v*, the pressure *p* exerted by the gas on the walls of the vessel is given by

$$p = \frac{1}{3}nmv^2$$

where *m* is the mass of one molecule.

Explain the reasoning by which this expression is modified to give the formula

$$p = \frac{1}{3}nm<c^2>.$$

....

.... [1]

(c) The density of an ideal gas is $1.2\,kg\,m^{-3}$ at a pressure of $1.0 \times 10^5\,Pa$ and a temperature of $27\,°C$.

(i) Calculate the root-mean-square (r.m.s.) speed of the molecules of the gas at $27\,°C$.

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

(ii) Calculate the mean-square speed of the molecules at 207 °C.

mean-square speed = ... m^2s^{-2} [2]

 [Turn over