2 **(a)** State what is meant by an *ideal gas*.

.....

.....

.....[2]

(b) An ideal gas comprised of single atoms is contained in a cylinder and has a volume of $1.84 \times 10^{-2}\,m^3$ at a pressure of $2.12 \times 10^{7}\,Pa$.
The mass of gas in the cylinder is 3.20 kg.

(i) Determine, to three significant figures, the root-mean-square (r.m.s.) speed of the atoms of the gas.

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

(ii) The temperature of the gas in the cylinder is 22 °C.

Determine, to three significant figures,

1. the amount, in mol, of the gas,

amount = ... mol [2]

2. the mass of one atom of the gas.

mass = ... kg [2]

(c) Use your answer in **(b)(ii) part 2** to determine the nucleon number A of an atom of the gas.

A = ... [1]

[Total: 10]