

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

.....  
.....  
..... [2]

(b) An ideal gas at a pressure of  $1.6 \times 10^5 \text{ Pa}$  has a density of  $1.9 \text{ kg m}^{-3}$ .

(i) Show that the root-mean-square (r.m.s.) speed of molecules of this gas is approximately  $500 \text{ ms}^{-1}$ .

[3]

(ii) One molecule of the gas has a mass of  $4.7 \times 10^{-26} \text{ kg}$ .

Determine the thermodynamic temperature of the gas.

temperature = ..... K [2]

(c) Calculate the internal energy  $U$  of 6.0 mol of the gas in (b). Explain your reasoning.

$U =$  ..... J [3]

[Total: 10]