14 The fuel used in a camping stove is butane, which is stored in a canister as shown.

Some of the butane in the canister is in a liquid state, and some is a gas.

(a) When the stove uses the butane gas, some of the liquid butane evaporates.

Explain why the temperature of the canister decreases when the stove is used.

(3)

(b) The pressure inside the canister is 220 kPa and the temperature of the gas is 21 °C.

(i) The canister is in the shape of a cylinder of length 0.23 m and radius 0.11 m.

Calculate the number of molecules of butane gas in the canister.

Assume the volume of liquid butane inside the canister is negligible.

(4)

Number of molecules of butane gas = ...

(ii) Calculate the r.m.s. speed of the molecules of butane gas.

mass of butane molecule = 9.6×10^{-26} kg

(2)

r.m.s. speed = ...

(Total for Question 14 = 9 marks)