4

(a)

State the two conditions under which a real gas can be approximated to be ideal.

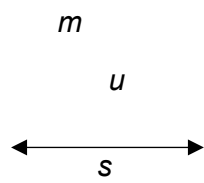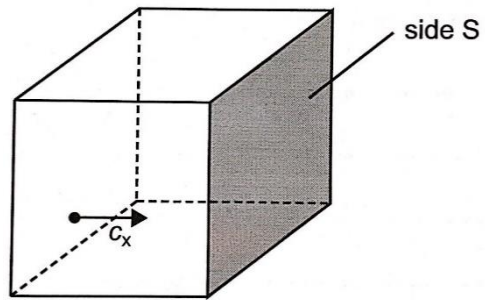…………………………………………………………………………………………….

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....

[2]

container with
wall of area A

(b)   *m*

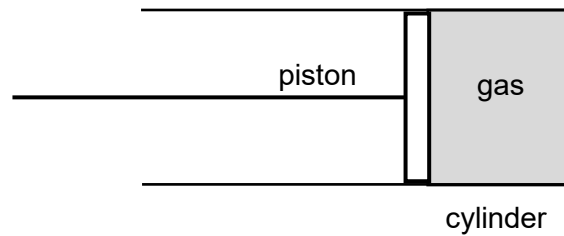   *u*

          ←————→
                s

Fig. 4.1

By considering one molecule, of mass *m* with initial velocity *u*, of a gas within a container of length *s*, as shown in Fig. 4.1, explain how its molecular movement causes the average pressure exerted, in the derivation of the kinetic theory of gases. Define all additional symbols used.
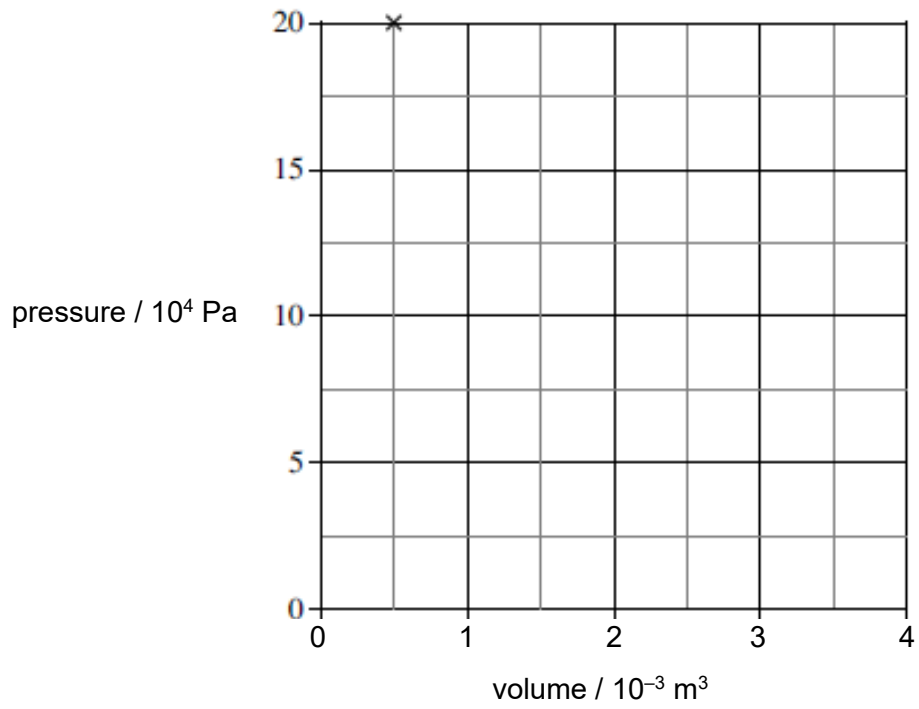
[3]

(c)

A cylinder, shown in Fig. 4.2, fitted with a gas-tight piston contains an ideal gas at a constant temperature of 20 °C. When the pressure p in the cylinder is 0.20 MPa the volume V is 0.50 × 10^{-3} m³.

piston · gas · cylinder

Fig. 4.2

An experiment is conducted and the data is plotted in Fig. 4.3.

20

15

Fig. 4.3

(i)

By plotting two additional points, draw a graph on the axes given in Fig. 4.3 to show the relationship between *p* and *V* as the piston is slowly pulled out such that the temperature of the gas remains constant.

[2]

(ii)

Calculate the number of gas molecules in the cylinder.

number of gas molecules = ………………………..

[2]

(iii)

Determine the total kinetic energy of the gas molecules.

total kinetic energy = ………………….. J

[2]