1 The average mass of an air molecule is 4.8×10^{-26} kg

What is the mean square speed of an air molecule at 750 K?

A 3.3×10^5 m^2 s^{-2} ⬭

B 4.3×10^5 m^2 s^{-2} ⬭

C 6.5×10^5 m^2 s^{-2} ⬭

D 8.7×10^5 m^2 s^{-2} ⬭

(Total 1 mark)

2 A transparent illuminated box contains small smoke particles and air.
The smoke particles are observed to move randomly when viewed through a microscope.

What is the cause of this observation of Brownian motion?

A Smoke particles gaining kinetic energy by the absorption of light. ⬭

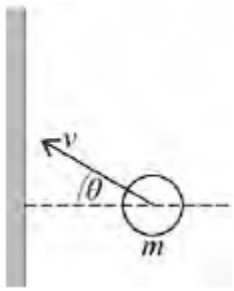
B Collisions between smoke particles and air molecules. ⬭

C Smoke particles moving in convection currents caused by the air being heated by the light. ⬭

D The smoke particles moving randomly due to their temperature. ⬭

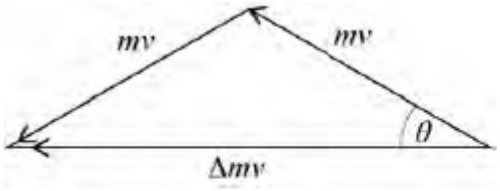
(Total 1 mark)

3 The diagram shows a gas particle about to collide elastically with a wall.

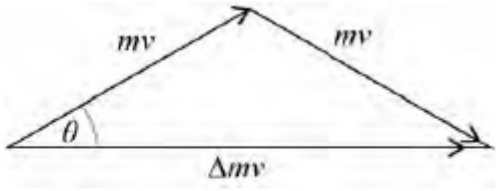


Which diagram shows the correct change in momentum Δmv that occurs during the collision?

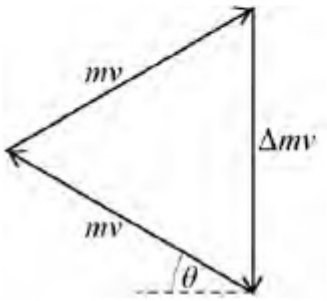
A



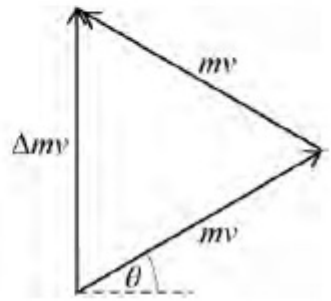
B



C



D



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

4 Specimens **P** and **Q** of the same gas exert the same pressure. **P** is at a temperature of 280 K and contains 10^{20} molecules per unit volume. The temperature of **Q** is 350 K.

What is the number of molecules per unit volume in **Q**?

A 0.09×10^{20} ⬭

B 0.75×10^{20} ⬭

C 0.80×10^{20} ⬭

D 1.25×10^{20} ⬭

(Total 1 mark)

5 The composition of a carbon dioxide (CO_2) molecule is one atom of $^{12}_{6}C$ and two atoms of $^{16}_{8}O$.

What is the number of molecules of CO_2 in 2.2 kg of the gas?

A 1.0×10^{22} ⬭

B 3.0×10^{22} ⬭

C 3.0×10^{25} ⬭

D 4.7×10^{25} ⬭

(Total 1 mark)

6 (a) A number of assumptions are made when explaining the behaviour of a gas using the molecular kinetic theory model.

State **one** assumption about the size of molecules.

_____

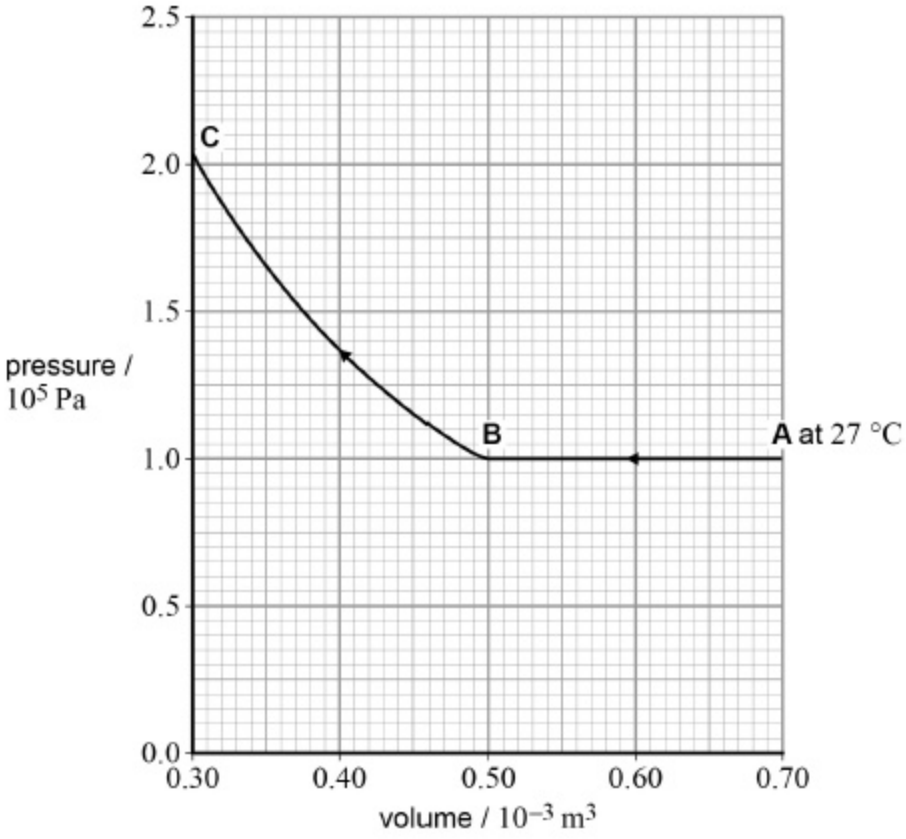
_____

_____

(1)

The graph shows how the pressure changes with volume for a fixed mass of an ideal gas.

At **A** the temperature of the gas is 27 °C. The gas then undergoes two changes, one from **A** to **B** and then one from **B** to **C**.



(b) Calculate the number of gas molecules trapped in the cylinder using information from the initial situation at **A**.

number of molecules = _____

(2)

(c) Calculate, in K, the change in temperature of the gas during the compression that occurs between **A** and **B**.

change in temperature = _____ K

(2)

(d) Deduce whether the temperature of the gas changes during the compression from **B** to **C**.

(2)

(e) Compare the work done on the gas during the change from **A** to **B** with that from **B** to **C** on the graph.

(3)

(Total 10 marks)