

11 (a) Diagram 1 represents the atoms of a gas inside a container.

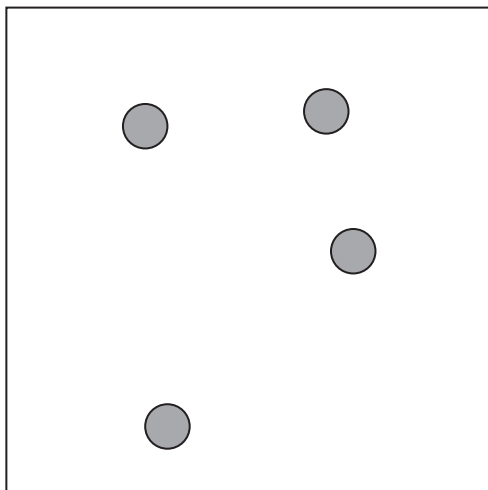


Diagram 1

(i) Explain how the atoms exert a pressure on the walls of the container.

(3)

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(ii) Explain why the pressure of the gas in the container decreases as its temperature decreases.

The volume of the container does not change.

(2)

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(b) Diagram 2 shows a device called a magneto-optical trap (MOT).

Physicists use the device to cool gases to extremely low temperatures.

The MOT uses laser beams and magnetic fields to trap a small collection of atoms with extremely small kinetic energies.

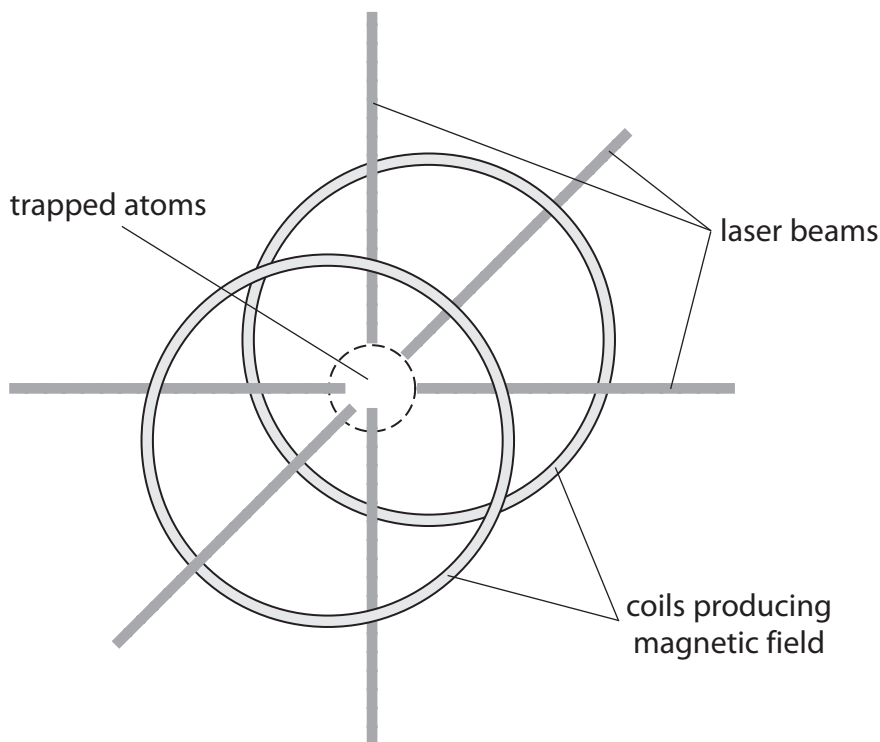


Diagram 2

Each trapped atom has a mass of 5.0×10^{-27} kg and a mean speed of 73 m/s.

Calculate the temperature of the trapped atoms.

[mean kinetic energy of an atom = $2.1 \times 10^{-23} \times$ temperature in kelvin]

(4)

temperature = K

(Total for Question 11 = 9 marks)

TOTAL FOR PAPER = 110 MARKS

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