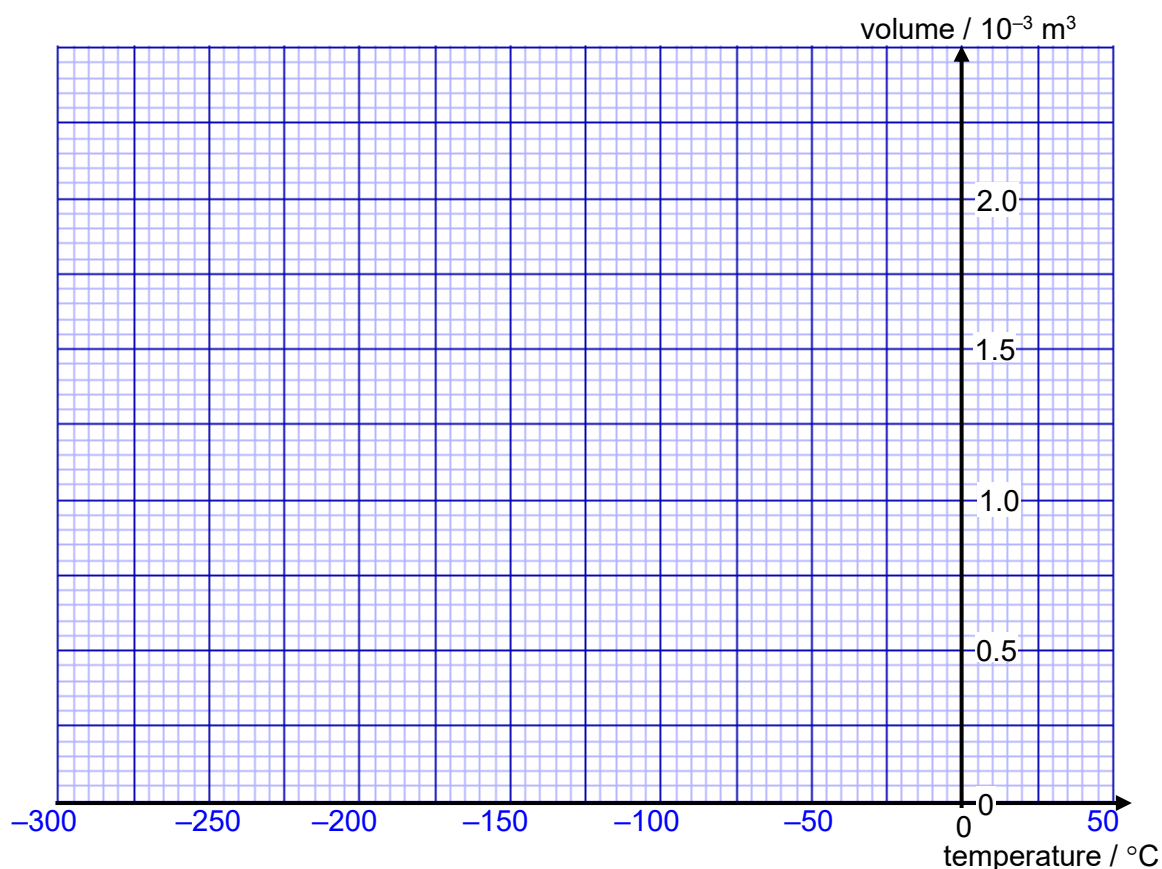**4** A fixed mass of ideal gas at a low temperature is trapped in a container at constant pressure. The gas is then heated and the volume of the container changes so that the pressure stays constant at 1.00×10^5 Pa.

When the gas reaches a temperature of 0.00 °C, the volume is 2.20×10^{-3} m³.

(a) Draw a graph on the axes below to show how the volume of the gas varies with temperature in °C. [2]

(b) Calculate the number of moles of gas in the container.

number of moles = ………………………… mol   [2]

(c) Calculate the average kinetic energy of a molecule when this gas is at a temperature of 50.0 °C.

kinetic energy = ………………………… J   [2]

(d) Hence or otherwise, calculate the total internal energy of the gas at a temperature of 50.0 °C.

internal energy = …………………………. J   [2]

(e) By considering the collisions of gas molecules with the walls of the container, explain why the volume of the container must change if the pressure is to remain constant as the temperature increases.

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