Additional Topic 3 questions

Test yourself

3.2 Modelling a gas

1 The density of copper is $8.96\,\text{g}\,\text{cm}^{-3}$ and its molar mass is $64\,\text{g}\,\text{mol}^{-1}$.

a Calculate the mass of an atom of copper.

b Determine the number of copper atoms per cubic metre.

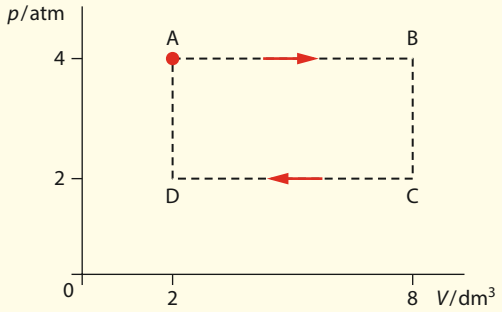
2 A volume of $2.00 \times 10^{-4}\,\text{m}^3$ of a gas is heated from 20.0 °C to 80.0 °C at constant pressure. Calculate the new volume.

3 Determine the number of moles in a gas kept at a temperature of 350 K, volume $0.20\,\text{m}^3$ and pressure $4.8 \times 10^5\,\text{Pa}$.

4 A gas is kept at a pressure of $4.00 \times 10^5\,\text{Pa}$ and a temperature of 30.0 °C. When the pressure is reduced to $3.00 \times 10^5\,\text{Pa}$ and the temperature raised to 40.0 °C, the volume is measured to be $0.45 \times 10^{-4}\,\text{m}^3$. Estimate the original volume of the gas.

5 An air bubble exhaled by a diver doubles in radius by the time it gets to the surface of the water. Assuming that the air in the bubble stays constant in temperature, predict by what factor the pressure of the bubble is reduced.

6 The point labelled A in the diagram shows the state of a fixed quantity of ideal gas kept at a temperature of 300 K. The state of the gas changes and is represented by the arrowed route in the pressure–volume diagram. The gas is eventually returned to its original state.



a Calculate the temperature of the gas at the corners of the rectangle on the pressure–volume diagram.

b Predict at what point on the dotted path the internal energy of the gas is greatest.