

- 5 (a) State the first law of thermodynamics.

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 [1]

- (b) A constant mass of an ideal gas has a volume of $3.49 \times 10^3 \text{ cm}^3$ at a temperature of 21.0°C . When the gas is heated, 565 J of thermal energy causes it to expand to a volume of $3.87 \times 10^3 \text{ cm}^3$ at 53.0°C . This is illustrated in Fig. 5.1.

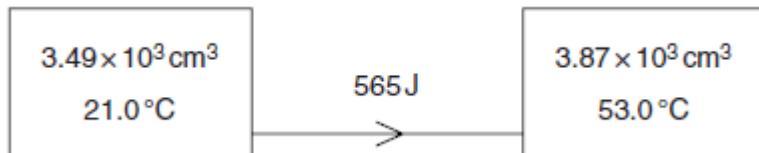


Fig. 5.1

- (i) Show that the initial and final pressures of the gas are equal.

[2]

- (ii) The pressure of the gas is $4.20 \times 10^5 \text{ Pa}$.

For the heating of the gas, calculate the work done by the gas.

work done = J [2]

- (iii) Hence determine the change in the internal energy of the gas.

change in internal energy = J [2]

- (iv)** Explain why the change in kinetic energy of the molecules of this ideal gas is equal to the change in internal energy.

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..... [3]

[Total: 10]