5 A mass of 0.37 kg of water at 100 °C is provided with the thermal energy needed to vaporise all the water at atmospheric pressure. The specific latent heat of vaporisation of water at atmospheric pressure of 1.0×10^5 Pa is 2.3×10^6 J kg^{-1}.

(a) (i) Calculate the thermal energy *Q* supplied to the water.

Q = ……J [1]

(ii) The mass of 1.0 mol of water is 18 g.

Show that the volume of water vapour produced is 0.64 m^3. Assume that water vapour can be considered to behave as an ideal gas.

[3]

(iii) The initial volume of the liquid water is negligible compared with the volume of water vapour produced.

Determine the work done by the water in expanding against the atmosphere when it vaporises.

work done = …… J [1]

(iv) Determine the increase in the internal energy of the water when it vaporises at 100 °C.

increase in internal energy = ……J [2]

(b) State and explain what happens to the internal energy of the water during the phase change process.

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[2]

[Total: 9]