3 **(a)** Fig. 3.1 shows a set up that measures the specific latent heat of vaporization of pure water.

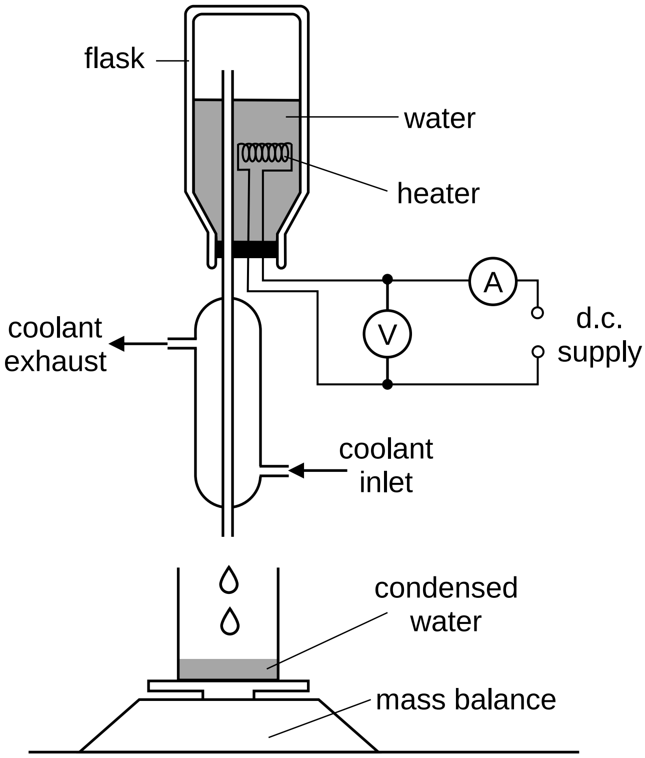

Fig. 3.1

The measurements in Fig 3.2 were made across 2 separate experiments each lasting for 1.5 minutes.

voltmeter reading / V	ammeter reading / A	mass of condensed water / g
78	5.0	16
60	4.0	10

Fig. 3.2

(i) Show that the specific latent heat of vaporization of water is 2.25×10^{6} J kg^{-1}.

[2]

(ii) The assumption when using the values provided in Fig 3.2 to determine the specific latent heat of vaporization of water is that the rate of heat loss from the system is constant.

Explain why the assumption is valid.

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.... [1]

(b) At a temperature of 100 °C and a pressure of 1.00×10^5 Pa, steam of mass 1.00 kg occupies a volume of 1.67 m^3. In comparison, liquid water of the same mass, at the same temperature and subject to the same external pressure, occupies a volume of 1.04×10^{-3} m^3.

1.00 kg of water undergoes phase change from liquid to gas at 100 °C and 1.00×10^5 Pa. Using **(a)(i)**, determine the

(i) heat supplied to the water,

heat supplied = ………………………………….. J [2]

(ii) work done by the water,

work done = ………………………………….. J [2]

(iii) increase in internal energy of the water.

increase in internal energy = ………………………………….. J [1]

(iv) The total potential energy and total kinetic energy of all the molecules in 1.0 kg of liquid water at a temperature of 100 °C is 3.41×10^5 J and 2.58×10^5 J respectively.

Find the potential energy of all the molecules in 1.0 kg of gaseous water at the same temperature and at the same external pressure.

potential energy = ………………………………….. J [2]

(v) Explain why energy has to be continuously supplied during the vaporization process.

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....

....

.... [3]

[Total: 13]