Q1.

An electric heater is used to heat some water.

Figure 8 shows the experimental setup used.

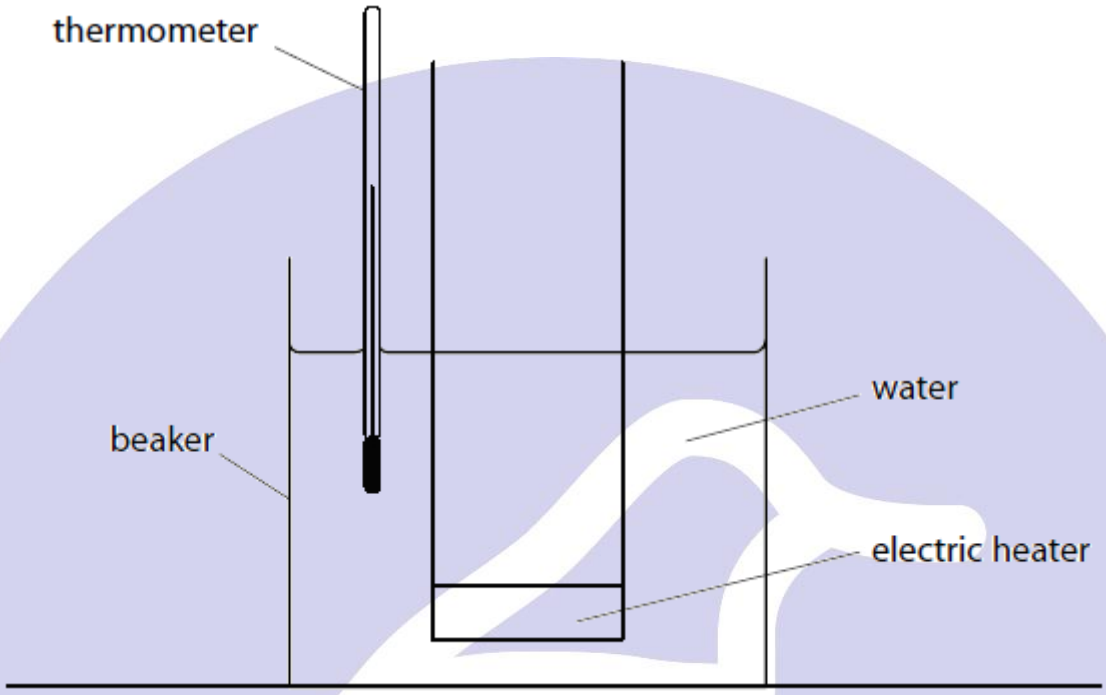

Figure 8

The initial mass of the water in the beaker is 0.72 kg.

The electric heater is switched on for some time and the water boils.

The mass of the water after the heater is switched off is 0.60 kg.

The thermal energy transferred to the water while it boils is 270 000 J.

Use an equation from the formula sheet to calculate the specific latent heat of the water.

(3)

specific latent heat = ... J/kg°C

(Total for question = 3 marks)

Q2.

A beaker contains 0.25 kg of water at room temperature.
The beaker of water is heated until the water reaches boiling point (100 °C).
The specific heat capacity of water is 4200 J/kg °C.
The total amount of thermal energy supplied to the water is 84 000 J.

The heating continues until 0.15 kg of the water has turned into steam.

The thermal energy needed to turn the boiling water into steam is 0.34 MJ.
Calculate the specific latent heat of vapourisation of water.
Use an equation selected from the list of equations at the end of this paper.

(2)

specific latent heat = ... MJ/kg

(Total for question = 2 marks)

Q3.

A student boils some water.

Calculate the amount of thermal energy needed to change 60.0 g of water to steam at its boiling point.

The specific latent heat of vaporisation of water, L, is 2.26×10^6 J/kg.

Use the equation

$$Q = m \times L$$

(2)

amount of thermal energy = ... J

(Total for question = 2 marks)

Q4.

An electric kettle is used to boil some water.

While the water is boiling, 566 000 J of thermal energy turns 0.250 kg of water into steam.

Calculate the specific latent heat of vaporisation of water.

Use an equation selected from the list of equations at the end of this paper.

(3)

specific latent heat = ... J/kg

(Total for question = 3 marks)

Q5.

An electric kettle contains 1.41 kg of water at 25 °C.

The kettle is switched on.

After a while, the water reaches boiling point at 100 °C.

The specific heat capacity of water is 4200 J / kg °C.

The kettle is kept switched on and the water continues to boil.

After a while, the mass of the water in the kettle has decreased to 1.21 kg.
The thermal energy supplied to the water during this time was 450 000 J.
Calculate the specific latent heat of vaporisation of water.
Use an equation selected from the list of equations at the end of the paper.

(3)

specific latent heat of vaporisation = ... J / kg

(Total for question = 6 marks)

Q6.

Another student decides to melt some ice.

The student melts 380 g of ice at 0 °C.

The specific latent heat of fusion of ice is 3.34×10^5 J/kg.

Calculate the thermal energy needed to melt the ice.

Select an equation from the list of equations at the end of this paper.

(2)

thermal energy needed = ... J

(Total for question = 2 marks)

Q7. – Change in State AND Change in Temperature

The espresso machine shown in Figure 27 is an electrical appliance.

(Source: © tanawaty/123RF)

Figure 27

The espresso machine has a steam pipe that can be used to heat milk in a jug, as shown in Figure 28.

(Source: © Wavebreak Media Ltd/123RF)

Figure 28

Steam from the pipe enters the milk, where steam condenses to water.

The steam and hot water heat the milk.

(ii) The specific heat capacity of milk is 3840 J/kg K.

The specific heat capacity of water is 4200 J/kg K.
The specific latent heat of condensation of steam is 2260 kJ/kg.
The temperature of the steam is 100°C
The mass of steam that condenses is 25 g.
The temperature of the milk rises from 5°C to 65°C.
By considering the transfer of energy from the steam to the milk, calculate the mass of milk that is heated by the steam and hot water.
Use equations from the formula sheet.

(4)

mass of milk = ... kg

(iii) Give **two** reasons why the actual mass of steam needed to heat the milk from 5°C to 65°C is greater than 25 g.

(2)

1 .....

.....

2 .....

.....

(Total for question = 8 marks)