Oxford Cambridge and RSA

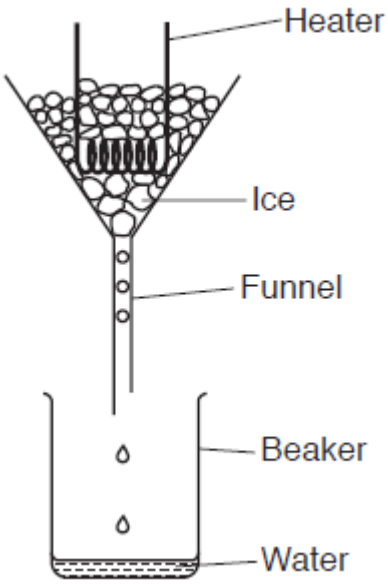
GCSE Physics A (Gateway)

J249/03 Physics A P1-P4 and P9 (Higher Tier)

Question Set 6

1 Two students design an experiment to find the specific latent heat of water.

They set up their equipment as shown in the diagram.



The students also have access to a power supply, a voltmeter, an ammeter, a stop-clock and a top-pan balance.

(a)* Explain how the students could use this equipment to determine an accurate value for the specific latent heat of water. **[6]**

1. The student needs to measure the weight of the empty beaker with the top-pan balance.
2. Then the student needs to set up the equipment like in the diagram; and connect the heater to the power supply and connect the ammeter in series and voltmeter in parallel. Also put a lid on the funnel to prevent heat loss.
3. Turn the power supply so the heater is on and start the stop-clock.
4. Record the voltmeter and ammeter readings.
5. Turn off heater (make sure you have enough water)
6. measure the new weight of the beaker and then subtract the original value to find weight of the melted ice.
7. Use the ammeter, voltmeter and time readings to calculate energy ($E = VIt$)
8. Calculate specific latent heat by doing E/m
9. Repeat this three more times to get an average

(b) The students find that 250g of ice takes 95kJ of energy to change state.

Calculate the specific latent heat.

$L = \frac{E}{m} = \frac{95\,000}{250/1000} = 38\,00\,00$

$= 3.8 \times 10^{5}$

Answer = 3.8×10^{5} ..... J / kg

[3]

Total Marks for Question Set 6: 9

Equations in physics

$(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$

change in thermal energy = mass × specific heat capacity × change in temperature

thermal energy for a change in state = mass × specific latent heat

energy transferred in stretching = $0.5 \times \text{spring constant} \times (\text{extension})^2$

potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil

Higher tier only –

force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length