MR SULLY UNFOLDS PHYSICS ANSWERS

Specific latent heat

AQA 4.3.2.3
Particle model · Paper 1
Foundation & Higher

Name _____ Class _____ Date _____

When a substance changes state, its temperature doesn't change, but it still needs energy. This is **latent heat**.

KEY EQUATION

$$E = m L$$

E = energy (J)
m = mass (kg)
L = specific latent heat (J/kg)
Fusion: melting/freezing
Vaporisation: boiling/condensing

WORKED EXAMPLE

How much energy melts 0.2 kg of ice?
(L = 334 000 J/kg)
E = 0.2 × 334 000 = **66 800 J**

Section A · Recall and calculate

Grade 4–5

1 Define specific latent heat. [2]

The amount of energy required to change the state of 1 kg of the substance with no change in temperature.

2 What is the difference between the specific latent heat of fusion and of vaporisation? [2]

Fusion: solid ↔ liquid (melting/freezing).

Vaporisation: liquid ↔ gas (boiling/condensing).

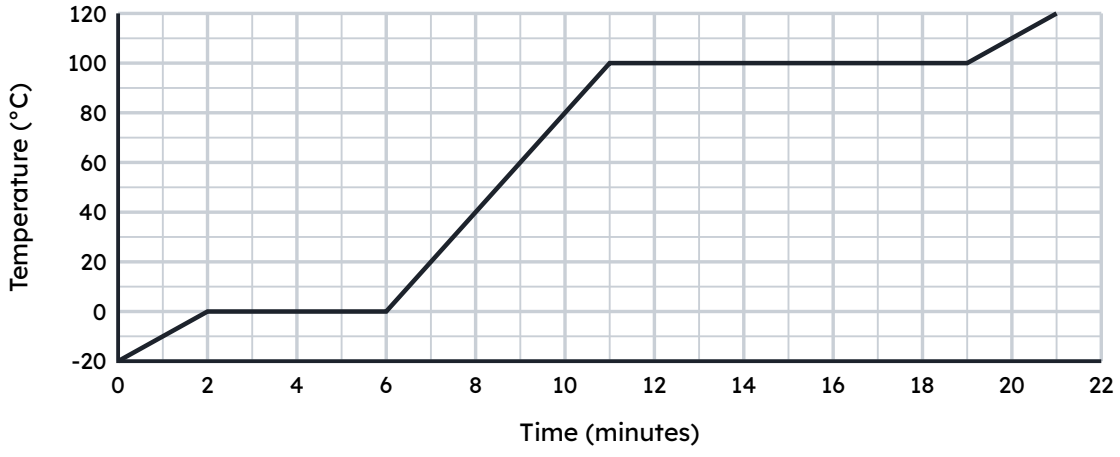
3 Calculate the energy needed to boil away 0.5 kg of water at 100 °C. (L = 2 260 000 J/kg) [2]

E = 0.5 × 2 260 000 = 1 130 000 J

Section B · Interpret the graph

Grade 5–6

4 The graph shows the temperature of some ice as it is heated steadily.



a State what is happening between 2 and 6 minutes. [1]

The ice is melting.

b Explain why the temperature doesn't change between 11 and 19 minutes. [2]

The water is boiling; energy is breaking bonds between particles,

increasing potential energy not kinetic energy.

c Suggest why boiling takes longer than melting. [1]

The specific latent heat of vaporisation is much bigger than that of fusion.

Section C · Stretch

Grade 7+

5 0.3 kg of ice at 0 °C is melted and the water is warmed to 20 °C. Calculate the total energy needed. (L = 334 000 J/kg, c = 4200 J/kg °C) [4]

Melting: E = 0.3 × 334 000 = 100 200 J

Warming: ΔE = 0.3 × 4200 × 20 = 25 200 J

Total = 100 200 + 25 200

= 125 400 J

Exam-style question

AQA style

6 A 3 kW kettle containing water at 100 °C is left switched on for 2 minutes. 0.15 kg of water boils away.

a Calculate the energy supplied by the kettle. [2]

E = Pt = 3000 × 120

E = 360 000 J

b Use these results to calculate the specific latent heat of vaporisation of water. [2]

L = E ÷ m = 360 000 ÷ 0.15

L = 2 400 000 J/kg

c The accepted value is 2 260 000 J/kg. Explain why the calculated value is too high. [2]

Some energy heated the kettle and the surroundings,

so not all the energy supplied was used to boil the water.

Total: _____ / 20

How confident am I?	Not yet	Nearly	Got it
I can use E = mL	☐	☐	☐
I can read heating and cooling graphs	☐	☐	☐
I can combine specific heat capacity and latent heat	☐	☐	☐