

Specific latent heat calculations

1. Calculate the specific latent heat of fusion if:
 - a) 28 000 J is supplied to turn 2 kg of solid oxygen into a liquid at $-219\text{ }^{\circ}\text{C}$.
 - b) 183 600 J is supplied to turn 3.4 kg of solid sulfur into a liquid at $115\text{ }^{\circ}\text{C}$.
 - c) 6600 J is supplied to turn 600 g of solid mercury into a liquid at $-39\text{ }^{\circ}\text{C}$.
 - d) 67 000 J is supplied to turn 200 g of ice into a liquid at $0\text{ }^{\circ}\text{C}$.
2. Calculate the specific latent heat of vaporisation if:
 - a) 335 200 J is supplied to turn 400 g of liquid ethanol into a gas at $78\text{ }^{\circ}\text{C}$.
 - b) 987 800 J is supplied to turn 2.2 kg of liquid hydrogen into a gas at $-253\text{ }^{\circ}\text{C}$.
 - c) 53.25 kJ is supplied to turn 250 g of liquid oxygen into a gas at $-183\text{ }^{\circ}\text{C}$.
 - d) 7620 J is supplied to turn 30 g of liquid trichloromethane into a gas at $62\text{ }^{\circ}\text{C}$.
3. How much energy is needed to turn 2 kg of water, at $100\text{ }^{\circ}\text{C}$ into steam at $100\text{ }^{\circ}\text{C}$ if the specific latent heat of vaporisation of water is $2\,260\,000\text{ J/kg}$?
4. How much heat energy is given out when 500 g of steam at $100\text{ }^{\circ}\text{C}$ condenses at $100\text{ }^{\circ}\text{C}$?
5. What mass of oxygen can be boiled if, 138 450 J of energy is supplied into liquid oxygen at $-183\text{ }^{\circ}\text{C}$ if the specific latent heat of vaporisation of oxygen is 213 kJ/kg ?
6. In an experiment to find the specific latent heat of fusion, 0.024 kg of water was collected in a beaker in 300 s with the heater turned off. The beaker was emptied and placed under the funnel again. With the heater turned on for exactly 300 s, the joule meter reading increased from zero to 15 000 J and 0.068 kg of water was collected in the beaker.
 - a) Calculate the mass of ice melted because of the heater being turned on.
 - b) Use the data to calculate the specific latent heat of fusion of water.
7. How long will it take a 50 W heater to melt 2 kg of ice at 0°C if the specific latent heat of fusion of ice is $335\,000\text{ J/kg}$?
8. When a falling hailstone is at a height of 2 km its mass is 2.5 g.
 - a) What is its potential energy?
 - b) Assuming that all of this potential energy is converted to latent heat during the fall, calculate the mass of the hailstone that would melt while falling.
 - c) Calculate the mass of the hailstone on reaching the ground. [Specific latent heat of fusion of ice = $335\,000\text{ J/kg}$, acceleration due to gravity = 9.8 m/s^2]

Useful equations and information:

Energy (J) = Mass (kg) x Specific latent heat (J/kg)

GPE = $m \times g \times h$

A 50 W heater transfers 50 J of energy every second.