

3.4 Specific latent heat

If you heat a solid, eventually it will start to melt. This happens at the melting point. The temperature of the material won't increase until all of the material has turned to liquid. During the time that the material is melting, all of the energy supplied is going in to weakening the bonds that hold particles in fixed positions.



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The specific latent heat of fusion (L_f) is the energy required to change 1kg of a material from a solid to a liquid. (Note: The word 'specific' means 'per unit mass'.)

$$L_f = \frac{\Delta E}{m}$$

where ΔE =energy added in joules, m =mass of material in kilograms

(1) Looking at the equation, what are the units for specific latent heat of fusion?

(2) 167000 joules of energy are required to melt 0.5kg of ice. What is the specific latent heat of fusion for H_2O ? (Hint: Enter the values in the equation.)

(3) Rearrange the equation (at top) to make energy added the subject (i.e. $\Delta E = \dots$).

(4) The specific latent heat of fusion for gold is 67000J/kg. How much energy would be required to melt 0.05kg? (Hint: Use the rearranged equation.)

(5) Rearrange the equation (at top) to make mass the subject (i.e. $m = \dots$).

(6) The specific latent heat of fusion for silver is 88kJ/kg. At the melting point, 5000J of energy is supplied to a solid piece of silver. How much silver will melt? (Hint: Use the rearranged equation. Take care to substitute for 'kilo' in kJ.)

If you heat a liquid, eventually it will start to boil. This happens at the boiling point. The temperature of the material won't increase until all of the material has

turned to a gas. During the time that the material is boiling, all of the energy supplied is going into weakening the bonds that hold particles close together.

The specific latent heat of vaporisation (L_v) is the energy required to change 1kg of a material from a liquid to a vapour.

$$L_v = \frac{\Delta E}{m}$$

where ΔE =energy added in joules, m =mass of material in kilograms

(7) *Looking at the equation, what are the units for specific latent heat of vaporisation?*

(8) *1130kJ of energy are required to turn 0.5kg of water to steam. What is the specific latent heat of vaporisation for H_2O ?*

(9) *The specific latent heat of vaporisation for gold is 1645kJ/kg. How much energy would be required to vaporise 0.05kg? (Hint: Use the correct rearranged equation. Take care of the 'kilo' in kJ.)*

(10) *The specific latent heat of vaporisation for silver is 2390kJ/kg. At the boiling point, 5000J of energy is supplied to liquid silver. How much silver would vaporise? (Hint: Use the correct rearranged equation. Take care to substitute for 'kilo' in kJ.)*