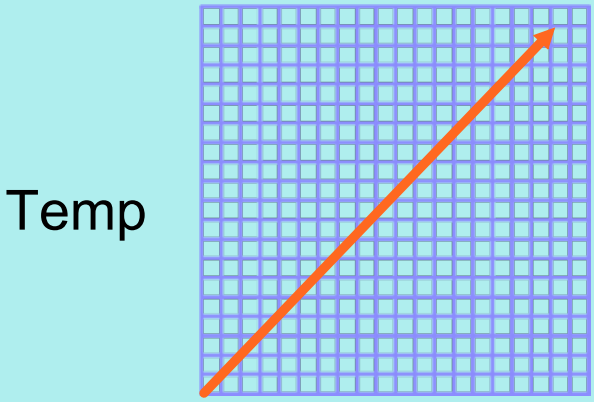
Latent Heat

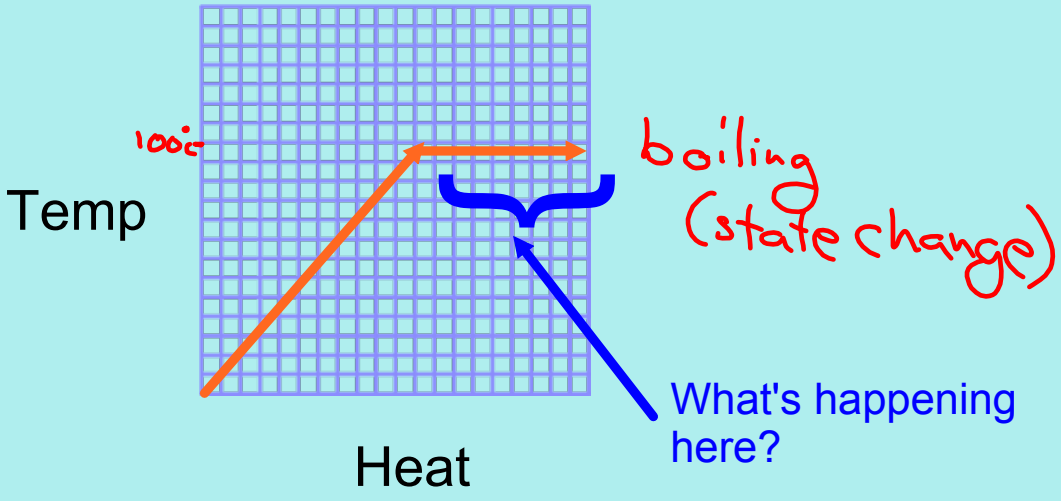
Will a substance continually increase in temperature as heat is added?



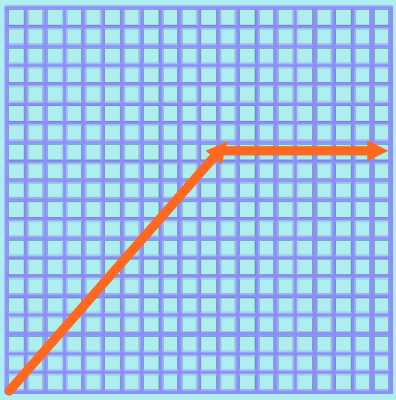
No!

Cl

From the lab over the last few days we saw that the water we heated didn't increase in temperature forever but stopped.



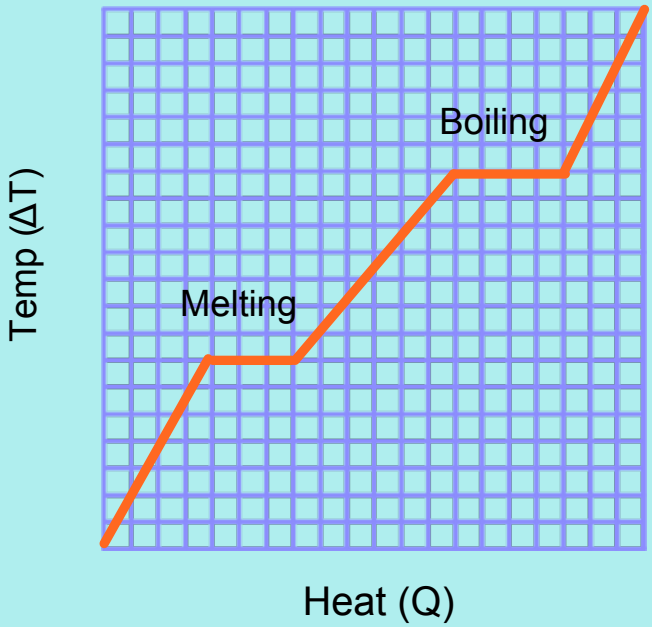
Temp



Heat

the flat part shows a change in state. All energy is being used to boil the water.

This would be the graph for the whole heat range of water



We have a calculation for how much heat is needed to raise the temperature of a substance

$$Q=mc\Delta T$$

We need a new one for how much heat is needed to change states

$$Q = mH$$

H_f Latent Heat of Fusion

melting/freezing

H_v Latent Heat of Vaporization

boiling/condensing

How much heat is needed to melt 1.0 kg of lead that is currently at 23.0°C? Lead melts at 327.5 °C.

$m = 1.0\,kg$

$T_1 = 23.0°C$

$T_2 = 327.5°C$

$Q_1 = mc\Delta T$

$= 1.0\,kg \times 130\,J/kg°C \times (327.5°C - 23.0°C)$

$= 1.0\,kg \times 130\,J/kg°C \times 304.5°C$

$= 39585\,J = 40000\,J$

$= 4.0 \times 10^4\,J$

$Q_2 = mH_f$

$= 1.0\,kg \times 2.04 \times 10^4\,J/kg$

$= 20400\,J$

$= 2.0 \times 10^4\,J$

$Q_{Total} = Q_1 + Q_2$

$= 4.0 \times 10^4\,J + 2.0 \times 10^4\,J$

$= 6.0 \times 10^4\,J$

$= 60000\,J$

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