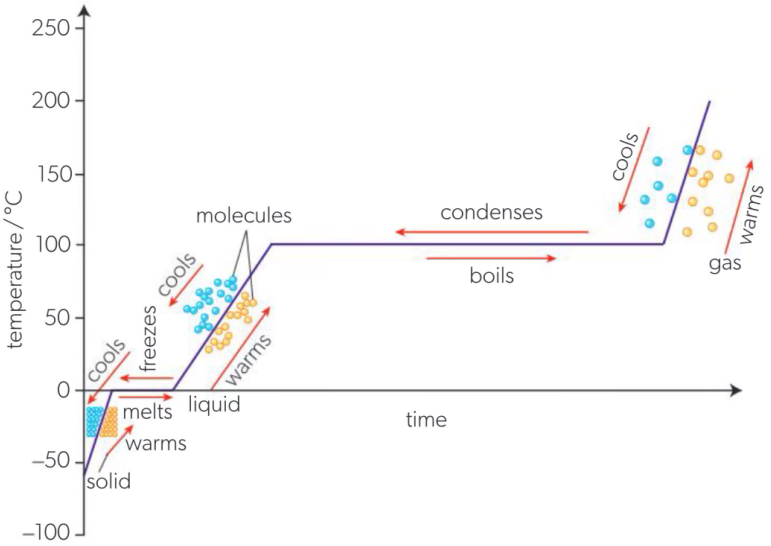
MYP - Analysing phase change graphs
Specified Concept - Transformation
Criteria focused - C
Subject specific skills - understanding the implication of gradient of a slope

The below context is from the book " IBDP physics HL - Oxford
Answer with reference to the fig

Specific heat capacity of…	
…ice / kJ kg^{-1} K^{-1}	2.1
…water / kJ kg^{-1} K^{-1}	4.2
… water vapour / kJ kg^{-1} K^{-1}	2.0
Specific latent heat of…	
…fusion of ice / kJ kg^{-1}	330
…vaporization of water / kJ kg^{-1}	2300

To help you to think about all these energy-transfer quantities, imagine a small block of ice removed from a freezer. Energy is transferred to the block at a constant rate until the ice has changed first into liquid water and then into water vapour. Figure 10 shows how the temperature of the block changes with time.



▲ Figure 10 How the temperature of a block of ice changes with time.

Energy is being transferred to the water at a constant rate, so the *x*-axis could also be "energy supplied". There would be no change in the shape of the graph.

The horizontal parts of the graph correspond to the temperatures at which latent heat (phase) changes occur. Even though energy is being supplied, the temperature is constant:

1. Looking at the length of the horizontal line, justify the values of specific latent heat of fusion of ice and specific latent heat of vaporisation of water given in the key chart above
2. Identify on the diagram, the latent heat of vaporisation of water and latent heat of fusion of ice
3. Explain why specific latent heat of fusion of ice is less than the specific latent heat of vaporisation of water
4. The section of the graph that have positive gradients correspond to heat capacity changes where temperature is increasing. Identify on the graph the three specific heat capacity on the graph
5. Do the gradient justifies the values of specific heat capacity of ice , water and water vapour.
6. Calculate the energy required to change the phase from liquid to gas of a mass of 2 kg water