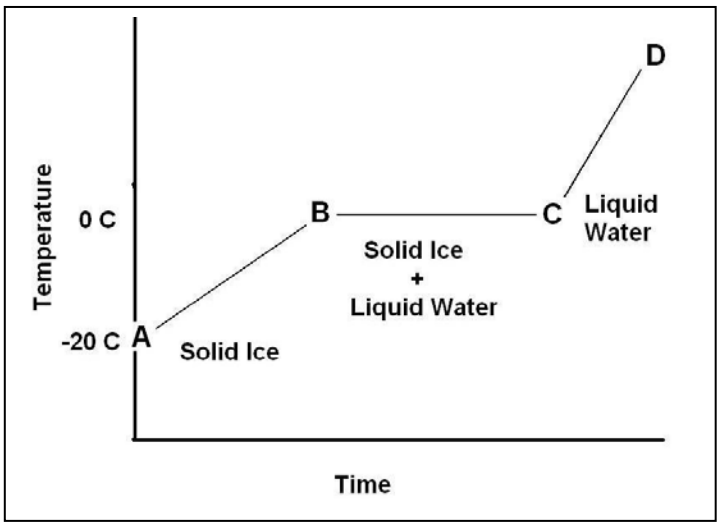

As energy is added to solid matter, it changes its state. The figure to the left shows what happens to water as it changes from solid ice (A to B), to a mixture of cold water and 'ice cubes' (B to C) and then finally to pure liquid water (C to D).

The energy required to change a kilogram of solid ice by one degree Celsius is called the **Specific Heat**. The energy needed to change a kilogram of solid ice at 0^{o}C into 100% liquid water at 0^{o}C is called the **Latent Heat of Fusion**.

Problem 1 - The Specific Heat of ice is 2090 Joules/kg C. How many Joules of energy do you need to raise the temperature of 1 kg of ice from -20^{o}C to 0^{o}C along the path from A to B on the graph?

Problem 2 - The Latent Heat of Fusion for water is 333 Joules/gram. How many Joules of energy do you need to melt all the ice into a pure liquid along the path from B to C on the graph?

Problem 3 - The Specific Heat of liquid water is 4180 Joules/kg C. How much energy is needed to raise the temperature of 100 grams of liquid water to $+60^{o}$C for a nice warm cup of tea along the path from C to D in the graph?

Problem 1 - The Specific Heat of ice is 2090 Joules/kg C. How many Joules of energy do you need to raise the temperature of 1 kg of ice from -20^{O}C to 0^{O}C along the path from A to B on the graph?

Answer: The temperature difference is 20^{O}C, so for 1 kg of ice we need 2090 Joules/kgC x (1 kg) x (20^{O}C) = **41,840 Joules**.

Problem 2 - The Latent Heat of Fusion for water is 333 Joules/gram. How many Joules of energy do you need to melt all the ice into a pure liquid along the path from B to C on the graph?

Answer: For 1 kilogram of ice ,which equals 1000 grams, we need 333 Joules/gram x 1000 grams = **333,000 Joules**.

Problem 3 - The Specific Heat of liquid water is 4180 Joules/kg C. How much energy is needed to raise the temperature of 100 grams of liquid water to +60oC for a nice warm cup of tea along the path from C to D in the graph?

Answer: 4180 Joules/kgC x 0.1 kg = **418 Joules**.