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Day 15 Mar 12 Heat and energy. Heat capacity relationship.

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15.0.J Summary Status Report March 12

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March 12 Status Report

We did heating and cooling experiments to see how heat affected the temperature and phase of materials, and explored what about the materials (at the molecular level) would cause differences. In the heating/cooling curves, there were sloping lines when heat was exchanged in the absence of a phase change, and flat lines when there was a phase change. Here is some additional information.

Historical Terms

Latent Heat
(means “hidden”)

Formal Terms

Enthalpy (heat) of vaporization/condensation Liquid \rightleftharpoons Gas
Enthalpy (heat) of fusion/melting Solid \rightleftharpoons Liquid

For water, heat of vaporization is 40.7 kJ/mole, or 540 calories/gram
And the heat of fusion is 6.0 kJ/mole, or 80 calories/gram

Generally, the heat of vaporization is larger than the heat of fusion.
(Why does that make sense?)

Sensible Heat
(means “perceivable”)

Heat associated with making temperature of a material change
For a given amount of heat absorbed, the temperature change amount depends on the quantity of substance whose temperature is changing (we saw this effect in our data), and on the ways the atoms/molecules are bonded and structured (we didn't have enough data to show this)

Mathematically: heat = m C (T_{final} – T_{initial})

m: quantity of substance (grams or moles)

C: Heat Capacity – characteristic for the substance (amount of heat necessary to raise temperature of 1 gram (or 1 mole) of substance by 1 degree).

Note that substances with large heat capacities will change LESS in temperature for a given amount of heat.