**Problem Solving with Heat** **Energy**

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Heat energy is quite a complex concept.

The amount of heat energy that can be absorbed or released during a physical or chemical change can be affected by how many grams of the substance there is, what temperature the substance is at, and what the substance is.

We need a unit to define and quantify heat.

It is a unit that you might be very familiar with already: the calorie. 1 calorie = 4.19 J

1 Calorie = 1000 calories = 4.19 kJ

A calorie is a unit of energy--of heat energy.

Americans use the Calorie and Canadians and scientists use kJ.

**Q = mc∆T**

With every substance having a different specific heat capacity, it can be difficult to come up with a unit that describes all energy.

It was decided to pick a common substance to act as a standard against which all other substances would be measured.

The common substance picked was water.

c of water =

this means:

**Example 1:** How much heat is needed to raise 20.00 grams of water from 5.0 oC to 40.0 o C?

**Example 2:** How much heat in kJ is needed to raise 140.0 mL of water from 20.0 oC to 25.0 oC?

**Example 3:** How many grams of aluminum can be heated from 90.0 oC to 120.0 oC if 500. J are added knowing the specific heat of aluminum is 0.90/g oC.

**Example 6**: What is the specific heat capacity of a substance if 1676 J cause 25.00 grams of it to go from 60.0 oC to 190.0 oC?

**Example 7:** What is the final temperature of a piece of copper metal if 2095 J are applied to 40.00 grams of copper at 20.00 oC and the specific heat capacity of copper is 0.385 J/ g oC?