

Heat

Traditionally, Heat was measured in calories (cal):

- **1 calorie is an amount of heat needed to increase the temperature of 1g of water by 1°C.**
- For nutritional/dietary purposes people use “big Calories” (Cal, with capital “C”). **1 Cal=1000cal (or simply kilocalorie). By definition, this is an amount of heat needed to increase the temperature of 1 kg (1 liter) of water by 1°C.**
- Heat is a form of energy, so calories can be converted to Joules:

$$1\text{cal}=4.184\text{J}$$

$$1\text{Cal}=1000\text{cal}=4184\text{J (used for dietary purposes)}$$

Homework 21

Problem 1

How much heat energy in calories is needed to heat 1 gallon of water by 45 °F ?

Hint: mass of 1 gallon of water is about 3.8 kg.

Problem 2

A blacksmith is forging some iron instruments. How much heat energy in joules is needed to heat 2 kilograms of iron by 1000 °C (to improve its' pliability)? Specific heat of iron is 860 J/(kg °C).

Problem 3 (bonus)

How much energy, in Joules, do you consume with each standard serving of your favorite food (check the nutrition label)? Assuming that you need about 70,000 J to run 1 mile, what distance can you run on one serving?