

C3.1c, C1.1C, C1.1B Calorimetry Experiment: **Which Nut Has More Energy?**

<http://youtu.be/siIfGK4iwUw>

Background: How can you calculate the amount of calories (potential energy) contained in a nut, gum drop, or marshmallow? You can't measure potential energy directly; you have to convert it to kinetic energy. Kinetic energy is measured using a thermometer, kinetic energy is equal to temperature, and temperature measures the average kinetic energy of the molecules in a system. You can measure the energy contained in a nut in much the same way your body does, you can burn it. Measuring the temperature of a burning nut would burst the thermometer; you will measure the temperature change of the nut indirectly by transferring the temperature change to water, which heats up slower than the nut due to its specific heat. Distilled water absorbs heat at the rate of **4.18 J/g x °C**. This means that for every 4.18 J of energy the water receives from the burning nut, 1g of water will increase its temperature by 1°C. Calorimeter literally means measurement of heat.

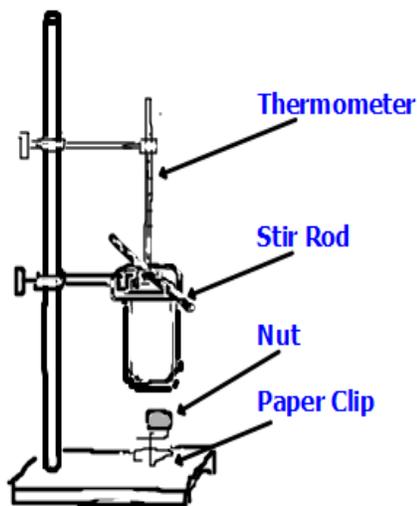
q	=	m	x	C	x	ΔT
PE	=	Mass of H ₂ O	x	Specific Heat of H ₂ O	x	Change in Temperature of H ₂ O
(J)		(g)		(J/g x °C)		(°C)

Materials:

- 100 g distilled water
- 100mL graduated cylinder
- 1 soda can
- 1 Paper clip, adjusted to hold nut
- 3 different types of nuts
- 1 Ring stand
- 1 Ring clamp
- 1 clamp
- 1 stir rod
- 1 thermometer

Procedure:

1. Pour 100g of distilled water into soda can (calorimeter)
2. Hang soda can with stir rod on ring clamp and set up as shown in figure below:



3. Configure the paper clip so that it can hold the nut then place nut on paper clip, under soda can
4. Lower thermometer, make sure it does not hit the bottom of the can (if it does it will measure the temperature of the aluminum can not the water)
5. Light the nut, if it burns out before nut is completely burned quickly light it again, continue
6. Record the highest temperature of the water reached
7. Repeat steps 1-6 for the other two nuts

Design the Data Table You Will Need:

Analysis and Conclusion:

1. For each of the nuts, calculate the potential energy of the nut in joules (J), report in data table and then convert this into calories. ($4.18\text{J}=1\text{cal}$)

2. After filling in the data table, analyze and synthesize it; state your claim, evidence, and explain your reasoning.

Claim:

Evidence:

Reasoning: