

Name:

Partners' name(s):

Laboratory 10: Energy in Chemical Reactions

Lecture Notes

1. How is heat measured?
2. How are heat and temperature different?
3. What is a calorie?
4. What is heat of solution?
5. What is heat of reaction?:

Endothermic and exothermic energy diagrams

Endothermic	Exothermic

Purpose: To determine the heat of a chemical reaction

Procedure and Observations and Data: (To be done in groups of two)

A. How much energy is in a peanut

1. Measure the mass of the apparatus (i.e., A stickpin that is attached to a cork)
2. Place 1/2 of a peanut on the apparatus and find the mass. **Be careful. Do not let the pin go into your finger. Your instructor will show you how to do this safely.**
3. Put exactly 25 ml of water in a test tube. Measure and record the temperature of the water.
4. Light the peanut on fire with a match and once the nut is lit, quickly hold the test tube of water, using a test tube holder, over the nut. The goal is to get as much heat into the water as possible (Is it possible to get all of the heat into the water?)
5. Do not let the water boil! Blow out the flame before this happens.
6. After the nut has burned, measure and record the temperature of the water.
7. Record the mass of the apparatus and nut after it was burned. Be sure to pick up any crumbs that fell off of the pin.
8. Repeat this experiment until you have burned 3 peanuts.
9. Draw a picture of the experiment.

Table 1:

	Mass of apparatus	Mass of apparatus and nut (initial)	Mass of apparatus and nut (final)	Temperature of water (initial)	Temperature of water (final)	Mass of water used
1.						
2.						
3.						

Calculations (do this for each peanut)

Show all of the calculations for one peanut below but show the results of all calculations in a table.

1. What is the initial mass of the nut?
2. What is the final mass of the nut ?
3. What is the change in mass of the nut?
4. What is the change in temperature of the water?
5. What is the heat gain of the water in Calories?
6. What is the heat gain of the water in Calories?
7. What is the experimental heat loss of the nut in Calories?
8. What is the heat loss per gram of the nut?
9. What is the average heat loss per gram of the nut?
10. What is the theoretical heat loss per gram of the nut in Calories? (from the average)

11. What is the efficiency of this experiment? (from the average)

Table 2:

Initial mass of nut	Final mass of nut	Change in mass of nut	Change in temp. of water	Heat gain of water cal.	Heat gain of water Cal.	Experimental heat loss of nut in Cal.	Experimental heat loss per gram of nut in Cal.	Ave. heat loss of nut	Theo. heat loss of nut	% Eff.

Questions and Answers:

1. **What is the difference between heat and temperature?**

2. **How could you make it so that more of the heat from the burning nut goes into the water?**

3. **The mass of the nut went down and the temperature of the water went up. Did you change matter into energy? Make sure you explain your answer with evidence.**

4. What happened to the matter of the nut that was burned?

5. How did the energy get into the nut in the first place?

6. How can a Diet Coke® have zero Calories?

Conclusions and Reflections

1. What are two questions you have about the heat of a reaction?

2. How does your body get the heat/energy out of the nut?

3. How does a car get the energy out of a gallon of gas?

4. How does this experiment reinforce what you learned in the previous experiment?

5. When you are learning, do you prefer to be told explicitly how each topic relates to the previous or upcoming topics? Why or why not?

6. What might be an advantage to telling students how topics relate?

7. What might be a disadvantage to telling students how topics relate?

8. What are some advantages and disadvantages of relating science to things that occur in daily life?
