

Chapter 16 Heat Investigation

Complete the following three activities on your own paper to include in your portfolio. Make sure that you use 1) diagrams, 2) data tables and calculations, and 3) written explanations so that this will serve as a future reference in your portfolio. Make it look nice!

Basic Information on Measuring Heat:

Units of heat energy were originally defined by the “calorie.” **One calorie (cal) is the amount of heat necessary to raise the temperature of one gram of pure water one degree Celsius.**

Another unit used to quantify heat energy is the Joule (J). A Joule is a “derived” unit in SI because it is made up of combining “basic” units from SI, specifically, m, s, and kg.

The formula for kinetic energy is $KE = \frac{1}{2} mv^2$, where “m” is mass in kg, and “v” is velocity in m/s. In multiplying out the right side of that equation with the appropriate units, one obtains the units of $kg \cdot m^2/s^2$.

$$1 \text{ kg} \cdot \text{m}^2/\text{s}^2 = 1 \text{ J}$$

and

$$4.186 \text{ J} = 1 \text{ cal}$$

Activity 1: Thermite Reaction

Document the thermite reaction as demonstrated in class. Include the balanced equation and a written explanation and description of the reaction as carried out in class.

Activity 2: Understanding the Units of Calories and Joules

Heat up water in a beaker to the boiling point. Take appropriate data to be able to **calculate the amount of heat** that was necessary to accomplish this task. Show data in data tables and units on your calculations. Also, document your procedure.

Activity 3: Heat Transfer and Specific Heat Capacity

Put an object in the hot water bath and leave it there long enough so that it reaches thermal equilibrium with the water bath.

Transfer the “hot object” into a known amount of “cool water” that is inside a styrofoam cup.

Measure the final temperature of the “hot object in the cool water.”

Using what you know about how much heat it takes to change the temperature of water, calculate how much heat left the “hot object” and went into the “cold water.”

It takes 1 cal or 4.186 J to raise the temperature of one gram of water one degree Celsius. **How much energy does it take to raise the temperature of one gram of your object one degree Celsius?**