

Physics II
Lab 1 – Coffee Cooling Experiment¹

NAME:

SECTION:

PURPOSE: Part of the beauty of Physics is its applications to explaining how everyday phenomena work at a fundamental level. In the “Coffee” Cooling experiment we will do just that. Specifically, we will apply some fundamental physics to model the temperature over time while a cup of coffee cools.

There are two parts to this exercise. First, we will acquire data in a controlled experiment. Second, we will try to model the results.

Part I

PROCEDURE: This is an extremely simple experiment. Follow the steps outlined below.

1. Fill a beaker with 200-500 milliliters of water.
2. Measure and record the ambient temperature of the room in the vicinity of your experimental setup.
3. Bring the water to a boil after placing the beaker on a hot plate. If you want to watch the water temperature as it increases, make sure the thermometer bulb *does not* touch the beaker – especially the bottom.
4. Use tongs to get the beaker off the hot plate, and set the beaker on the table. Place a thermometer into the middle of the body of water and begin to measure and record the temperature every 10 seconds after insertion of the thermometer. Note: *Do not* stir the water with the thermometer.
5. Continue to measure until the temperature of the water reaches $\sim 40^{\circ}\text{C}$.
6. Use a computer to plot ΔT vs. t , where ΔT is the *difference* in temperature between the water and the surroundings, and t is the time. Although it is not imperative at this point, you should use Microsoft Excel because then you will be all set up for Part II.

¹Important: Read this in its entirety before doing the lab.

7. Use a computer to plot $(-\ln(\frac{\Delta T}{\Delta T_0}))$ vs. t , where ΔT_0 is the initial value of ΔT .
Formulate a hypothesis about the time dependence of the temperature of the water.
State your reasons for your educated guess.
8. Turn in
 - (a) This sheet of instructions.
 - (b) Your *two* plots.
 - (c) Your hypothesis and rationale. (Please type.)