

cooling_a_cup_of_coffee

THIS IS THE VERY FIRST INVESTIGATION OF THE YEAR AND NO BACKGROUND IS GIVEN ON RATE OF COOLING OR THE FACT THAT SLOPE OF A GRAPH REPRESENTS RATE OF CHANGE.

In this lab you will develop a method for exploring the rate of cooling of a hot liquid.

In a hypothetical situation, a person likes to have a cup of coffee in the morning as he or she is waiting for the bus to arrive at the bus stop. It is against the law to bring a beverage onto the bus and just as the person is leaving the house he or she pours the coffee into a styrofoam cup.

The question is, "Should I put cream from the refrigerator into the coffee before I leave the house or should I wait until I get to the bus stop?" Which condition will cause the coffee to reach the ideal temperature quickest?

Students needed to **determine what materials** they would require and design a lab activity that gave them **sufficient relevant data**.

The most critical component of this lab is that the students graph the rate of cooling of the coffee in both conditions; the first one being that the cream is added immediately after the coffee is poured into the cup. The second condition being that a given amount of time lapses before the cream is poured into the partially cooled coffee. (however they are not told this explicitly)

Initially no further instructions are given, the idea being that the students should investigate based on their own experiences and science know-how.

This generally leads to generally good results except for one detail; the students seldom take temperature readings frequently enough in order to get a good graph of the rate of cooling of the coffee, generally because they still do not understand the relationship between the slope and the rate of change.

After two days of nearly fruitless data collection, the results are discussed with the students and the suggestion that the students take temperature readings as frequently as possible (sufficient relevant data) is made.

The students continue. The suggestion that they take the temperature more frequently IS still the only specific instruction that is given.

The lab continues for three more days with students using only handheld stopwatches and handheld digital thermometers along with appropriate volume measuring graduated cylinders

After the fifth day, the students are introduced to computer based data collection (Vernier) along with two temperature probes that can be run simultaneously and graphed as a function of time and asked to repeat the lab.

Students are then asked to read IB “Experimental Measurements and Internal Assessment” before writing up their lab report.

- They are instructed to give detail of the three different experimental designs that they followed in their report.
- Interactions on writing the title page of the report are given

No other instructions are given.