Physical Science (PHSC 100) Virtual Lab Expt. # 5: Heat Loss and Change in Temperature

Name: _____ Section: _____ Date: _____

Note on this virtual experiment

Read the introductory principle, procedure and experimental materials outlined below, and understand as to how this virtual experiment would be conducted under real lab condition to generate the data supplied in Tables 1 below. After clearly understanding the procedure and the formula for the calculations, complete the blank columns with calculated data, write brief discussions as per the guideline, and **Submit it back in the Drop Box.**

Introduction

Heat always flows from objects of high temperature to those of low temperature, until the temperature reaches equilibrium. If hot water is left at room temperature it will lose heat until the temperature reaches its surroundings. The **amount of heat** lost **(Q)** is proportional to the **mass** and **specific heat capacity** of the material and the change in **temperature.** This can be determined using the following equation:

$$Q = mc\Delta T$$

Where **Q** is the quantity of heat lost in calories, **m** is the mass (in gram, 1 ml = 1g for water), **c** is the specific heat capacity (**1.0 cal/g ^{0}C** for water) and **ΔT** is the change in temperature in Celsius.

The objective of this experiment is to study the **quantity of heat lost** and the change in temperature of hot water under **covered** and **uncovered** conditions.

Materials Required
- Hot plate
- cardboard covers with holes
- Beaker
- Styrofoam cups
- Thermometer
- Graduated cylinder
- Stopwatch

Procedure

Heat Loss and Change in Temperature

A litter of water is **brought to boiling** in a pan on an electric hotplate.

100 ml of hot water is poured into **cup #1** and another **100ml** of hot water into **cup #2** and **the temperatures measured** with separate **thermometers.**

Cup # 1 is left **uncovered** and **cover cup #2** is covered with a piece of cardboard with a hole in the center for inserting a thermometer. The thermometers are left to stay in both covered and uncovered cups for continuous temperature measurement.

The initial **temperature** for both covered and uncovered cups is measured and recorded in the appropriate column on the data table for both covered and uncovered at **0 minute** and from then on **at 10-minnutes intervals** for **40 minutes**.

Data Calculation and Interpretation Assignment

First calculate the change in temperature (ΔT) for each time interval always by subtracting the temperature at each time interval from the initial temperature (temperature at 0 min) and enter values in the change in temperature column. Do this for both covered and uncovered cups. Then calculate the **total quantity of heat (Q=mcT)** and **heat loss (Q = mcΔT)** in calories for each time interval for both covered and uncovered cups and enter values in the appropriate column. Where **Q = total quantity of heat, m = mass of water (1 ml=1g), c= specific heat of water**, which is **1cal./g/^{0}C**, and ΔT =change in temperature in ^{0}C. Calculate and fill out all blank columns.**Table. 1. Heat Loss / Heat Gain**

Q = M.C.ΔT

Q = quantity of heat,   **M** = mass of water (1 ml of water = 1g)

C = specific heat capacity of water (1cal/g/^{0}C), Δ **T** = change in temperature

Time (min)	Uncovered Cup	Covered cup	Heat Ratio: **Total Q-uncovered** Total Q-covered

	Temp (T) cup #1 (^{0}C)	Total Q(MCT) (Cal.)	Δ T (^{0}C) From initial	Heat loss Q= MCΔT (cal.) cumulative	Temp. (T) cup #2 (^{0}C)	Total Q (MCT) (Cal.)	Δ T (^{0}C) From initial	Heat loss Q= MCΔT (cal.) (cumulative)	
0 min	85		--	---	85		--	---	
10 min	52				66				
20 min	45				55				
30 min	39				47				
40 min	34				41				

Discussion

In the lined space below, briefly describe your experimental results by comparing the **change in temperature (T)** and **total quantity of heat** (**Q**) through time, for the **covered** and **uncovered** cups. Also give possible **explanations for the differences** in the **rate** and **quantity** of change in **Q** and **T** values under the two conditions (covered and uncovered). What does the **heat (Q) ratio**, between the **uncovered** and **covered** cups, through time indicate to you?

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