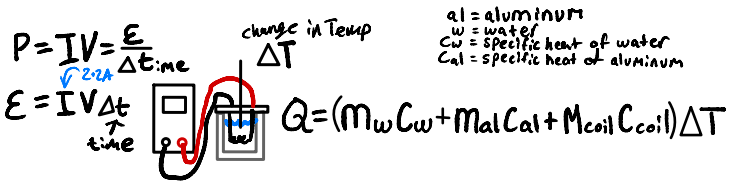

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Lab 04 – Electrical Energy

Lab Worksheet

Complete this lab worksheet and turn it in for credit. Show all your work including the calculations you performed (attach additional sheets if necessary).

Measure and record the mass of the aluminum cup.

Aluminum cup = 45.63 grams

m_{al}= mal= 45.63 grams

I. Data Collection

Follow the instruction detailed in sections 3.4.1 and 3.4.2. Record the values specified below.

Trial 1

m_{cup+w}	= 258.8g
m_w	= 213.17g
T_1	= 24.2 °C
T_2	= 34.2 °C
Δt	= 675 seconds

Trial 1

Time (min : s)	Time (s)	Temp (C)	Volts (V)
0:00	0	24.2	5.2
0:30	30	26.7	5.2
1:00	60	26.9	5.2
1:30	90	26.1	5.2
2:00	120	27.6	5.2
2:30	150	28.2	5.2
3:00	180	28.5	5.2
3:30	210	28.8	5.2
4:00	240	29.3	5.2
4:30	270	29.6	5.2
5:00	300	30	5.2
5:30	330	30.1	5.2
6:00	360	31.5	5.2
6:30	390	30.7	5.2
7:00	420	32.5	5.2
7:30	450	32.7	5.2
8:00	480	33.3	5.2
8:30	510	33.7	5.2
9:00	540	32.2	5.2
9:30	570	34	5.2
10:00	600	34.2	5.2

Make a quick graph of Temperature vs. time. Use this graph to determine if any of your techniques need to be adjusted for the second trial.

Trial 2

m_{cup+w}	= 244.2g
m_w	= 198.57g
T_1	= 24.5 °C
T_2	= 34.8 °C
Δt	= 645 seconds

Trial 02

Time (min : s)	Time (s)	Temp (C)	Volts (V)
0:00	0	26.9	5.2
0:30	30	27.1	5.2
1:00	60	26.7	5.2
1:30	90	28.1	5.2
2:00	120	27.5	5.2
2:30	150	28.1	5.2
3:00	180	28	5.2
3:30	210	29.1	5.2
4:00	240	29.8	5.2
4:30	270	29.6	5.2
5:00	300	30.4	5.2
5:30	330	30.1	5.2
6:00	360	31.3	5.2
6:30	390	31.4	5.2
7:00	420	31.8	5.2
7:30	450	31.9	5.2
8:00	480	32.6	5.2
8:30	510	33	5.2
9:00	540	33.3	5.2
9:30	570	33.5	5.2
10:00	600	34	5.2
10:30	630	33.7	5.2
10:45	645	34.8	5.2

II. Analysis

Estimate the uncertainty in each measured value. Justify your choice for each quantity.

δI = _____

δV = _____

δt = _____

δm = _____

δT = _____

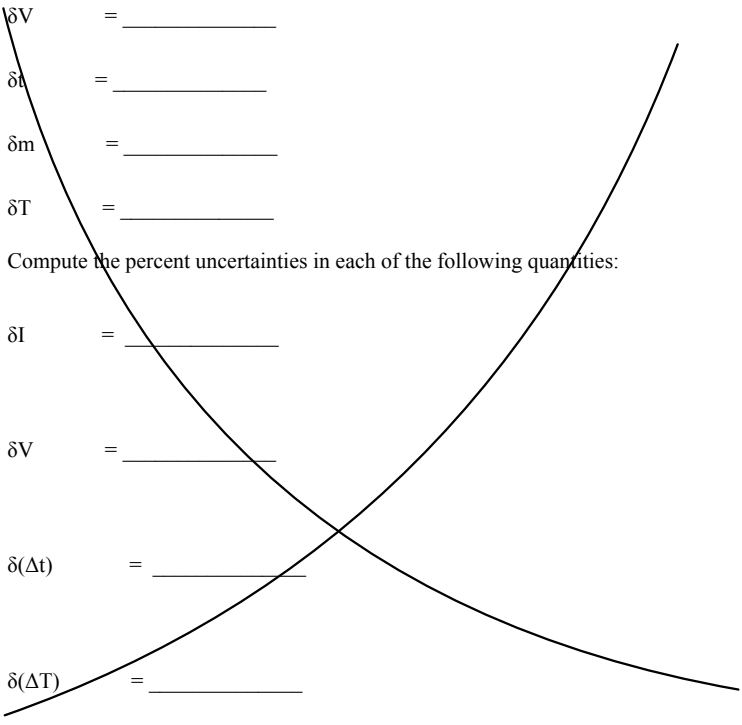
Compute the percent uncertainties in each of the following quantities:

δI = _____

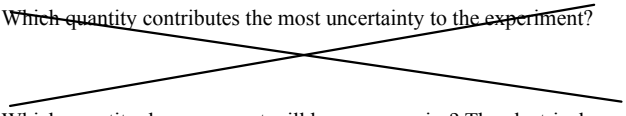
δV = _____

δ(Δt) = _____

δ(ΔT) = _____



Which quantity contributes the most uncertainty to the experiment?



Which quantity do you expect will be more precise? The electrical energy, or the thermal energy? Explain your answer.

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Plot both trials on a single graph as describe in the manual. Add error bars for the temperature and time measurements. Attach this graph to your worksheet.
Comment on the consistency of the two plots.

What is the meaning of the difference between the magnitude of the slopes while the current is on, and when it is turned off?

Plot both trials on a single graph as describe in the manual. Add error bars for the temperature and time measurements. Attach this graph to your worksheet.
Comment on the consistency of the two plots.

What is the meaning of the difference between the magnitude of the slopes while the current is on, and when it is turned off?

Compute the electrical energy lost by the circuit for both trials.

E1 = _____

E2 = _____

Compute the heat gained by the system for both trials.

Q1 = _____

Q2 = _____

Was one type of energy consistently higher? Explain why that may be.

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Compute the percent error for both trials.

Comment on the size of your percent error. Compare to the relative uncertainties you computed previously.